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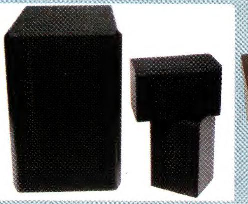

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- Build a moving-LED display
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- How it works: Inkjet printers
- Experimenting with valves

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because music matters

Changes

Change. It is in our nature to resist it, but unfortunately it is a part of life. Every industry needs to change to remain competitive, and this includes the magazine industry. I think you can guess what I'm leading up to here — Yes, EA is about to change.

As you know, EA hasn't always been EA. We started off 79 years ago in 1922 as *Wireless Weekly*, covering the new and growing phenomena called radio. This was a popular topic for a number of years, but radio wasn't enough to keep a magazine going indefinitely. So in 1939 we changed into *Radio and Hobbies* which covered everything from electronics to woodworking to card tricks.

As the Australian electronics industry progressed, so did we, and in 1955 we changed again, adding television to our name to become *Radio, Television and Hobbies*, or *R, TV&H* as we were commonly known.

Still things changed. In 1965, we dropped the rather cumbersome *R, TV&H* title so that we could follow electronics as a whole, instead of just radio and TV. As *Electronics Australia*, we expanded our coverage to encompass the rapidly growing Australian electronics industry, and its impact on our lives.

That was 35 years ago.

35 years is a long time in anyone's language, and in the world of electronics, it's an eternity. EA has to change again, and with January marking the start of the new millenium, it seemed as good a time as any.

Today, technology has a huge impact on our lives, and the new EA is going to reflect that more than ever. My concern is whether you, as a reader, are going to change with us.

I hope so, because we will be covering just about every aspect of today's technology, how it is applied in our world, and most importantly, how it applies to you. I hope you'll like what we have in store for you with our next issue — I'm excited about it, and I think you will be too.

Here's to change!

Graham

Graham Cattley, Editor

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Bulletin Board	It's still a little sick, but call (02) 9353 0627 and and see if it has recovered...			

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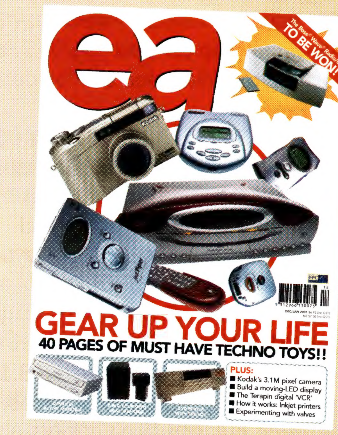
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PLUS:
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How it works: Inkjet printers
Experimenting with valves

Reviews, reviews, reviews! This month we take a look at the lastest and greatest techno-goodies to liven up your life. If you're interested in listening to music, watching video or taking photos, it all starts with our e-music section on page 14.

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of Circulations

Affordable Denon

RECOGNISED AS one of the main players in the DVD Home Theatre arena, Denon now announce their 'entry' level DVD player, the DVD-1000 priced at $749.

With the same high standard of all Denon's AV products, the DVD-1000 is designed to play DVD discs, CDs, and CD-Rs, and employs both x2 and x4 drives. A 4MB shock-resistant buffer memory ensures that both picture and sound are uninterrupted should the player be knocked or jolted. This technology is also useful when playing multi-layer DVDs where the laser shifts from one layer to another.

The DVD-1000 features the latest Dolby (AC-3) 5.1 and DTS digital outputs plus support for 24-bit, 96kHz PCM Digital Audio Output capability that can be sampled at 48 and 96kHz. Video performance is enhanced by a 10-bit video D/A converter section as opposed to conventional 9-bit processing, which enables the best picture resolution possible — particularly when used with projection systems and large screen displays.

The DVD-1000 will also play the latest in standard and high resolution CDs plus CDRs. In addition for late night viewers who don't want to disturb neighbours the DVD-1000 features a compression feature that reduces the sound tracks dynamic range. This is useful when you want to enjoy a film at quieter listening levels where quite often, softer dialogue and lyrics cannot clearly be heard.

■ *The Denon DVD-1000 (RRP $749) is covered by a two year parts and labour warranty. For further information on the DVD-1000 and other Denon products contact: Audio Products Australia on 1800 642 922 or email info@audioproducts.com.au.*

VAF's hi-tech subwoofers

THINK SUBS are all the same? Well think again. VAF's new LFE-03 and LFE-07 powered subwoofers now offer more than meets the eye. Already used by recording studios for their high accuracy and fidelity, the new VAF LFE-Series powered subwoofers also offer the scale and dynamic power required for a totally convincing home theatre experience.

Fundamental to the design of the new models is their ability to accurately reproduce wide dynamic range Low Frequency Effects soundtracks at high levels. Their electronics modules have been designed completely in-house at VAF and feature 'state of the art' surface mount technology, plus monolithic class A/B amplifiers.

■ *The LFE-07 also features a balanced input for enhanced immunity to hum, and two separate power amplifiers to drive their own individual woofer systems within the one compact enclosure. Teamed with this are woofers that move a massive 30mm and cabinets that take account of the reflected sound from the floor and walls of your room to ensure the smoothest and most accurate response. As usual with VAF, sales are factory direct only and prices are $843 for the LFE-03 and $1538 for the LFE-07. Contact VAF on FreeCall 1800 818882 or* ***www.vaf.com.au*** *for details.*

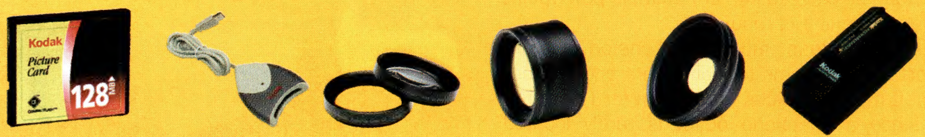
Creative control and digital ease.

The New Kodak DC4800 Zoom Digital Camera

Perfect for people who are passionate about photography, the KODAK DC4800 has the quality and convenience you've come to expect from Kodak. Loaded with features, the DC4800's 3.1-megazpixel resolution gives you outstanding prints up to 11" x 14". Manual and automatic settings give you creative control and flexibility to get the pictures you want. Saturated, neutral, black and white, or sepia colour balance provides even greater creative freedom. A 3X-optical 28 x 84mm and 2X-digital zoom lets you choose wide-angle or telephoto to capture precious details. All in a compact design with a neck strap that makes it more comfortable to use and easier to carry - especially convenient when travelling.

For more information on the Kodak DC4800 call 1300 130 674 or visit www.kodak.com/go/dc4800

Recommended accessories:



KODAK Picture Card, 128MB

KODAK USB Picture Card Reader

43mm Ektanar Close-up Lens

43mm Ektanar Telephoto Lens

43mm Ektanar Wide Angle Lens

KODAK Lithium-ion Battery and External Charger

Kodak **Kodak Digital.**

Versatile Camcorder

HITACHI AUSTRALIA have announced the availability of a new family of Digital 8 camcorders offering all the advantages of digital recording technology together with the capability of replaying older 8mm and Hi-8 videotapes.

The VM-D965LE and VM-D865LE Digital 8 camcorders join the current line-up of analogue 8 mm and Hi-8 cameras from Hitachi, completing a range of camera's from an entry level price of $849.00, all the way to the top of the range Digital 8 unit at $1699.00.

Digital 8 camcorders are capable of digitally recording video, audio and a wide range of data and control signals onto Hi8 videotape at digital-video quality of 500 lines, with an i.link (IEEE) digital output for computer connection. In-built Digital time Base Correction achieves a playback picture equivalent to that of a more expensive DVC.

Best of all, these new cameras are capable of replaying existing stocks of older 8mm and Hi-8 tapes you may have, with the advantage of then being able to feed the images into a computer via the i.Link port. Those years of treasured moments can continue to be enjoyed or archived forever, while enjoying the higher resolution of Digital 8 technology.

Both cameras include class-leading features that ensure the user gets maximum value for money. Its x500 digital zoom (plus x22 optical zoom) is a boon for that elusive distant shot while Electronic Image Stabilisation ensures a shudder free image. The inbuilt 2.5" LCD display with Active Screen backlighting is works well under all lighting conditions, and both cameras offer advanced PCM Digital Stereo for the finest audio effects.

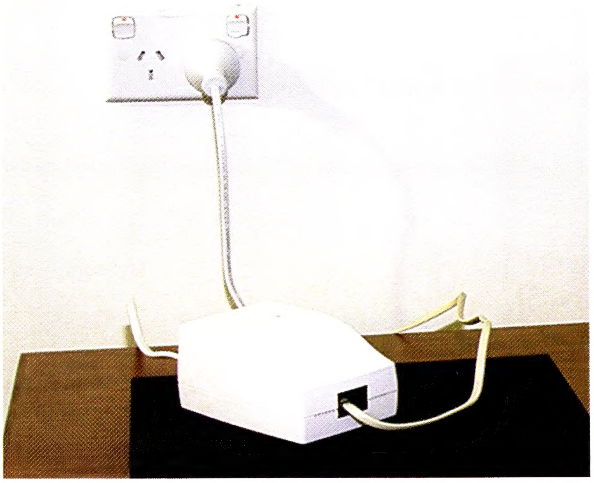
■ *The VM-D865LE has a RRP $1499.00 incl GST and the VM-D965LE RRP $1699.00 incl GST, both products are available now from leading retailers throughout Australia.*

E-Jack it

EASYJACK is a wireless phone or modem extension system that turns any suitable powerpoint into a phone outlet, transmitting data signals over 240V electrical wiring in the home. It can be plugged into any powerpoint in the home or office, providing an 'instant' phone line wherever a powerpoint is located.

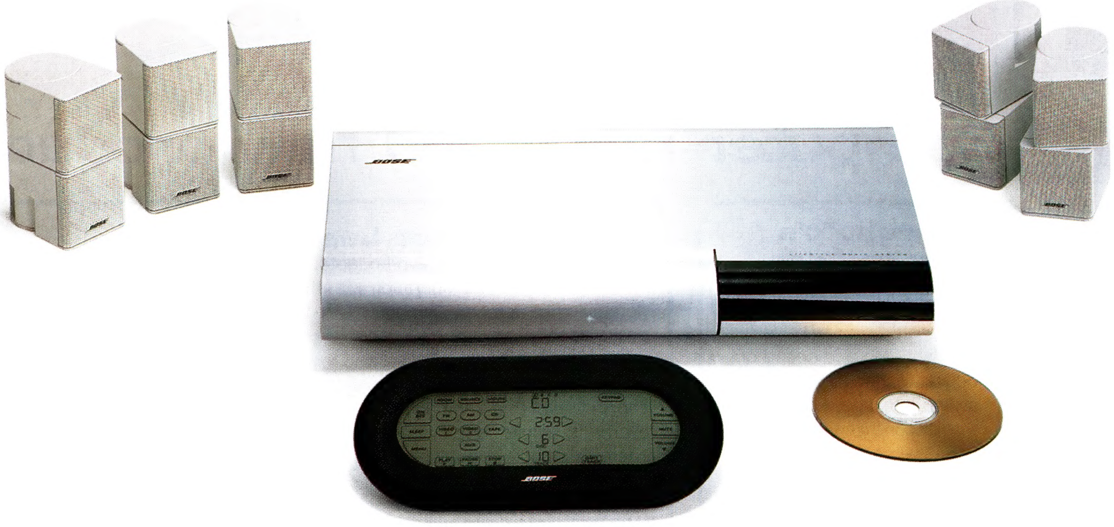
The system includes a Base Unit, an Extension Unit and a 3m phone cord. The system is installed by connecting the Base Unit into powerpoint and an existing phone outlet. The Extension Unit can then be plugged into any suitable powerpoint where an additional phone line is required.

EasyJack is also wireless modem extension system designed to support V.90 modems for computers and Internet television systems. It has an obvious application for TV set top box connections since a telephone outlet is rarely located behind the television — it's also easy to install; less than two minutes.



■ *The system puts freedom to be mobile back into the definition of portable computing, eliminating the restriction of using a laptop only where a phone is located. In addition, it is perfect for the education market, offering a convenient modem connection in any classroom setting for teachers, educators, and trainers who wish to use the World Wide Web as part of their instruction.*

*Find out more about the EasyJack at **www.surftv.com.au.***



Put this Bose sound system in your lounge room.

And we'll put this one in your bedroom.

Treat yourself to one of two magnificent Bose® Lifestyle® systems for Christmas 2000 and we'll present you with a unique Bose® Wave® radio valued at $602.00 absolutely free of charge.

The Bose® Lifestyle® 40 Music System is our most versatile high-performance music system, while the Bose® Lifestyle® 50 Home Theatre System is the most advanced Bose® system for digital surround sound and music.

Both utilise the very latest technology from our relentless research into sound reproduction and continue to perpetuate the legendary elegance of Bose design.

At their hearts, the palm-sized Lifestyle® Personal™ Music Centre replaces a conventional rack of buttons and dials yet puts you in complete control of your system with a simple touch, from anywhere in your home. You can forget the limitations of traditional audio systems.

Our Lifestyle® 50 delivers astounding 5-channel surround sound from any source. The most demanding DVDs and CDs, TV, VHS tapes... even mono sources.

The accompanying Bose® Wave® radio almost defies description. Providing audio quality you would expect from a much larger system, it's a small and revolutionary marvel of engineering.

Your Wave® radio will wake you each day to your favourite station in full, stereo, room-filling sound. It's no mere clock radio, in fact, the sound is so superb, you may wish to connect a CD player, cassette or even a VCR and TV.

To obtain the finest in home audio plus our very special Christmas gift, act now. This offer is only available from October 1, 2000 until January 14, 2001.

Phone **1800 023 367** for an information pack with the name of your nearest Bose dealer.

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upload

Computer news and new products

ea WINNERS

Pocketmail Giveaway winners

■ Here are the ten lucky winners of EA's October 2000 Pocketmail competition.

They will each receive a Palm Backflip (Palm Pilot add-on) or a PM32 mobile email device, as nominated in their entry.

The winners are:

Hai Do
St Johns Park, NSW
Palm BackFlip

Roger West
Millaa Millaa, QLD
PM32

Ian Herbert
Ringwood East, Vic
PM32

Clay Menyweather
Beerwah, QLD
PM32

Michael Cowling
Benowa, QLD
Palm BackFlip

David Boulton
Ringwood East, Vic
PM32

Colin Jeffrey
Ferntree Gully, Vic
PM32

Fenn Bailey
Eltham, Vic
PM32

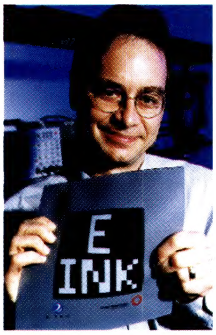
Ashley Scott
East St Kilda, Vic
PM32

Barry Jackson
West Melton, Vic
PM32

Microsoft's new rodent

▲ Supposedly combining beauty with brains, Microsoft's trackballs offer the precision and speed of optical technology in a stylish package. Equipped with second generation IntelliEye optical technology, the new trackballs are reported to be 33 percent faster than any other optical pointing device available.

The sensor captures 'snapshots' of the trackball at a rate of 2,000 images per second, resulting in the smooth, precise pointer movement - if it doesn't, your pet hamster can use it as a spaceship. (Business Wire photo)



e-ink

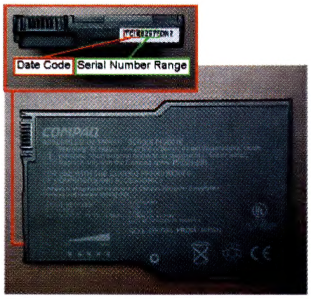
▲ It's interesting technology, but the bottom line is we couldn't resist the photo.

Dr. Paul Drzaic, director of display technology for E Ink, demonstrates the world's first flexible electronic ink display. (Business Wire photo)

Extremely Hot Laptops

▲ It turns out that your favorite laptop computer may actually turn out to be a fire hazard. In cooperation with the U.S. Consumer Product Safety Commission, Compaq Computer is recalling approximately 55,000 battery packs used in Armada E500 and V300 notebook computers.

These battery packs can develop short circuits that can cause them to overheat, smoke, and even catch fire. Therefore, users are advised to remove the defective batteries immediately. The company will give you two new battery packs for each defective one that you return. Affected units have the following date codes and serial numbers: TCGK 00001 to 10500, TCGK 20001 to 21800, TCGK 40001 to 83100, and TCHK 40001 to 44700. For information on the replacement program, visit **www.compaq.com/products/notebooks/batteryrecall**.

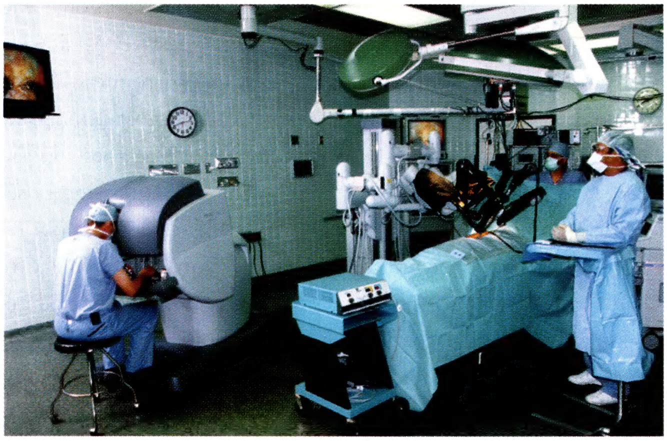


Robotic Surgical System Receives FDA Approval

▲ Intuitive Surgical, Inc. (www.intuitivesurgical.com) has received clearance from the U.S. Food and Drug Administration (FDA) to begin selling its da Vinci(TM) Surgical System in the United States for use in laparoscopic surgical procedures. It is said to be the only fully FDA-approved robotic surgical system commercially available in the U.S.A.

The da Vinci system consists of a surgeon's viewing and control console that includes an integrated, high-performance 3-D vision system, a patient-side cart consisting of three robotic arms that position and precisely maneuver endoscopic instruments and an endoscope, and a variety of articulating EndoWrist(TM) instruments. By integrating computer-enhanced technology with surgeons' technical skills, Intuitive believes that its system enables surgeons to perform better surgery. The da Vinci system directly translates the surgeon's natural hand, wrist, and finger movements on instrument controls at the surgeon's console outside the patient's body into corresponding micro-movements of instrument tips that have been positioned inside the patient through small puncture incisions.

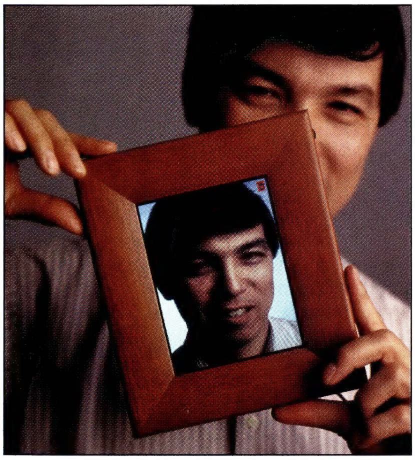
According to the company, the system has the potential for use in over 3.5 million procedures. Additionally, Intuitive believes that the availability of the system may generate an increase in the number of laparoscopic procedures performed. (Photo courtesy of Intuitive Surgical, Inc.)



Hybrid camera technology

▲ Kodak's new Advantix Preview Camera is the world's first film camera that lets consumers preview their pictures the moment they click the shutter, and immediately select the number of prints they want of each shot. This is made possible by a separate sensor and optics that displays a digital image of the picture on the camera's color preview screen (BusinessWire picture).

Kodak have also released their innovative Smart Picture Frame, which allows a picture to go right from a digital camera to a 'stylish' tabletop picture frame, without having to connect to a computer. Combining a memory card reader, colour display and modem, the Kodak Smart Picture Frame also makes sharing pictures with others easy. By subscribing to the StoryBox Network, created by Weave Innovations Inc., users can link their frames into a network for viewing, sharing and printing pictures. (picture: Shawn G. Henry)



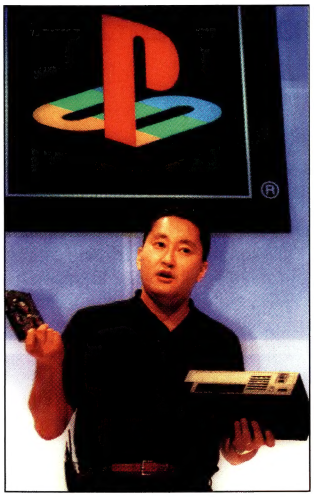
Domain explosion

▲ There are now 30 million Internet/World Wide Web domain names, including 18 million .coms, three million .orgs and and two million .nets. At this stage the most popular country domain is .uk.

It's predicted that the explosive growth of Internet use and e-commerce will cause the numbers to *double* again in the next 18 months. Crikey!

Playstation Shortage Generates a Loss

▲ Sony Computer Entertainment America (**www.scea.sony.com**) has revised its revenue projections for its video game business from a profit to a loss, based on its inability to build enough Playstation2 units to meet demand. Shipments are expected to be only 500,000 units for the remainder of the year, which is half the original goal.



The problem is that the graphic synthesizer chip, one of the Playstation's key components, is undergoing a design change from 0.25 micron to 0.18 micron traces, which has caused manufacturing problems. During its first five years, Sony sold more than 70 million units of the original Playstation worldwide.

Intel shows 1GHz laptop processor

▲ Under pressure to outperform upstart Transmeta in the market for laptop computer processors, Intel has showed off a new 1GHz chip that uses just two watts of power, along with a 500MHz version running at 0.5W. Both chips are planned to hit the market in early 2001.

The new laptop microprocessors will use a 0.13-micron process technology. "The focus we've had on laptop chips has been coming to fruition in these products very nicely", said Frank Spindler, manager of Intel's mobile-chip group. "These technologies put processors into extreme low-power states."

Start-up Transmeta has been giving Intel a run for its money in the market for low-power laptop systems with its innovative Crusoe processor. The chip uses mostly software, rather than circuitry to perform computing tasks. As such the device performance can be increased simply by downloading the latest processor software.

To further focus its laptop efforts, Intel is looking into establishing a second design architecture for mobile chips.

ea WINNERS

NIKON subscription prize winners

■ The two lucky EA subscribers who have won a Nikon F80 camera kit valued at $1495 are:

C. Edwards,
Dowsing Point, Tas

and

W. McPhillips,
Ballina, NSW.

Congratulations to these winners. They have each won the fantastic Nikon F80 camera, plus two matching lenses (28-80mm and 75-240mm).

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e-music

your guide to digital music

NEWS

■ Computer giant Hewlett-Packard has become the first company to be snagged by a German law requiring firms to pay fees for making CD burners that are being used to illegally lift the latest hits off the World Wide Web.

The case sets the stage for other European countries to possibly adopt similar rules to stem an epidemic that apparently costs the music industry an estimated $5 billion last year.

■ A California judge has ruled that online auction house eBay cannot be held liable for bootleg music sold on its site.

Unlike recent court cases involving unauthorized recordings, the ruling did not come as a result of a copyright suit and did not involve the music industry. Instead, a music fan named Randall Stoner brought the suit against the company under California's unfair competition law.

NEW STUFF

MP3-enabled Eric

▲ Addicted to your mobile phone? If it happens to be one of the 3-volt Ericsson models (T28 plus others) you can now enjoy MP3 music without missing any calls. Ericsson have introduced their matchbox-sized MP3 Handsfree which just clips onto the bottom of your phone, and plays MP3 music stored in its postage stamp sized 32MB multimedia flashram card.

This gives you around 30 minutes of music, with the phone 'host' providing the battery power (around 8 hours listening from a standard battery) and the control interface — the music automatically mutes when a call comes in.

The catch? At this stage the RRP in Australian is $440 (including GST), but some may see this as money well spent to have the coolest mobile phone around. For more information go to **www.ericsson.com**.

Control yourself

▲ Does your treble need trimming? Is your bass a bit basic and midrange mostly mediocre? What you need is the EQ-30 from Koss, with it's three-band stereo equaliser and volume control. It's powered by two AAA cells (15-20 hours use), and simply plugs inline with your headphone lead.

Around the size of a fat matchbox, the EQ-30 provides active boost and cut over three bands, a balance control, and heaps of extra volume. You can get it from David Reid electronics, phone (02) 9267 1385 for an RRP of $84.95.

Closet MP3 player

▲ Slowly but surely, mainstream home consumer manufacturers are acknowledging the impact and advantages of MP3-based music - licensing and copyright problems aside. Samsung have quietly released their DVD611 DVD player which, amongst a healthy list of conventional features, includes an 'MP3 CD-R compatible decoder system' — a subtle, but significant point...

Other than that, the DVD611 is a dual laser player with coaxial and optical digital outputs, a 10-bit video D/A converter, built-in Dolby Digital decoder and is compatible with CD/CD-R, VCD/CD and DVD formats. For more information go to **www.samsung.com**.

MP VROOM

▲ On the other hand, you don't have to be a global electronics manufacturer to create an MP3 music player that hits the spot. The enterprising bods at **www.carplayer.com** have produced a compact car/home MP3 player that is compatible with off-the-shelf CD and DVD drives, via the industry-standard ATAPI interface.

Depending on which drive you hook up to the unit, you can play MP3's stored on CD-ROM, CD-R, DVD, DVD-R, and CD-RW media, with the potential to hold up to 2200 files per disk. Called the MP-ROM, the unit supports all common CD file formats (ISO-9660, Joliet, etc) and can decode MPEG1, MPEG2 Audio Layer III and MP3 files (except those at 256kbs or more). It also accepts 63 playlist numbers in its user-programmable memory, and has Single, Shuffle, Repeat, and 10 second scan modes.

The MP-ROM is powered from 12V, and sports a 31-button remote control.

HOW TO

Snare streaming audio

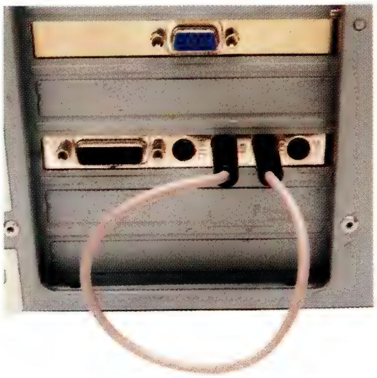
STREAMING AUDIO pumped out over the web by radio stations and dedicated music sites is a great way to listen to international programs and sample new types of music. It's available in a number of formats (Real Audio, Windows Streaming Media, Liquid Audio, Quicktime and so on) with players available as browser plugins, free standing applications, or both.

It's a great system. But the instant gratification it offers can turn to frustration when you realise that you can't actually save what you're hearing, so it can be played later. Copyright issues aside (much of the reason why the players don't have a save facility), it would be very useful to be able to store away that fascinating science talk streaming in from BBC Radio, or the live web-cast performance from your favourite Tibetan grunge/opera fusion band.

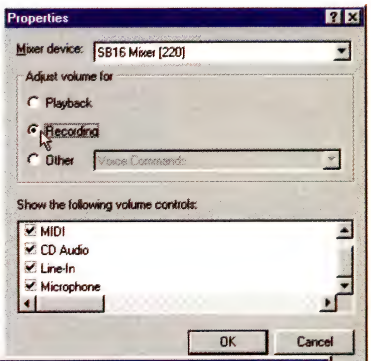
There are a couple of ways it can be done though; one is primitive but effective, and the other uses a clever little shareware program...

METHOD 1:
Make an analogue recording via the soundcard.

1 **MAKE UP** (or buy) a short stereo cable with 3.5mm stereo plugs on each end, then connect it between your soundcard's line-in and line-out sockets – the card must be full-duplex.



2 **IF THE** recording software you plan to use doesn't have an input level control, you'll need to change Windows Volume Control over to recording mode. Select Properties, then the Recording option – close that window, and make sure that the Select box is checked for Line-in.



Properties

Mixer device: SB16 Mixer [220]

Adjust volume for

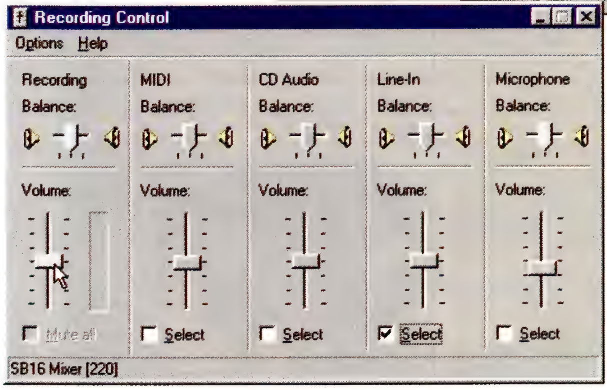
○ Playback

● Recording

○ Other Voice Commands

Show the following volume controls:

☑ MIDI
☑ CD Audio
☑ Line-In
☑ Microphone

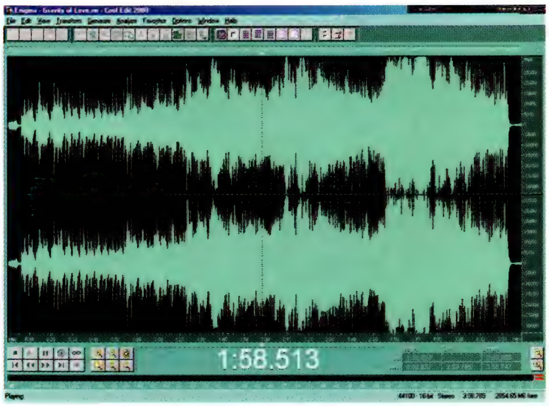


Recording Control

Recording	MIDI	CD Audio	Line-In	Microphone
Balance:	Balance:	Balance:	Balance:	Balance:
Volume:	Volume:	Volume:	Volume:	Volume:
☐ Mute all	☐ Select	☐ Select	☑ Select	☐ Select

SB16 Mixer [220]

3 **NEXT, START** up your favourite audio recording software (we've used the wonderful CoolEdit 2000), chase up some streaming audio on the web, then start recording while checking/adjusting the incoming level.



4 **WHEN YOU'VE** finished recording (watch out, long sessions produce huge file sizes) save the result as a WAV file, or better still, as an MP3-one of CoolEdit's cool features.

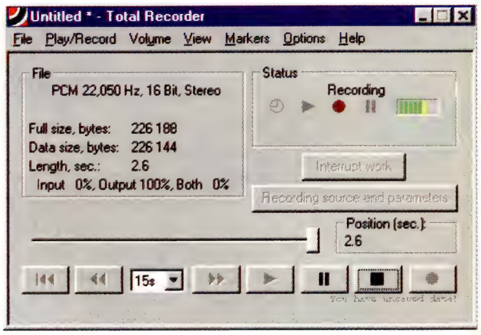
METHOD 2:
Use a clever program like Total Recorder

It may look like any other Windows sound recorder, but the special thing about Total Recorder is that it can *directly* record streaming audio without the need for cables, or other analogue jiggery-pokery.

When you start Total Recorder, it seamlessly inserts a software driver between the incoming data stream and the soundcard, so it then has full access to the data. It's neat, and it works.

The program is very configurable and well-behaved, with all sound settings and data paths returning to normal when it's shut down. It will save sound files in a variety of formats including WAV, but unfortunately not MP3 – we used MPEG Encoder v0.07 (freeware) for that.

Total Recorder is available at **www.highcriteria.com**, but as downloaded will only record for 40 seconds. The registration is a paltry US$11.95 though - a bargain! **ea**



Untitled * - Total Recorder

File Play/Record Volume View Markers Options Help

File

PCM 22,050 Hz, 16 Bit, Stereo

Full size, bytes: 226 188
Data size, bytes: 226 144
Length, sec.: 2.6
Input 0%, Output 100%, Both 0%

Status

Recording

Interrupt work
Recording source and parameters

Position (sec.): 2.6

You have unsaved data!

Review: The J-Box

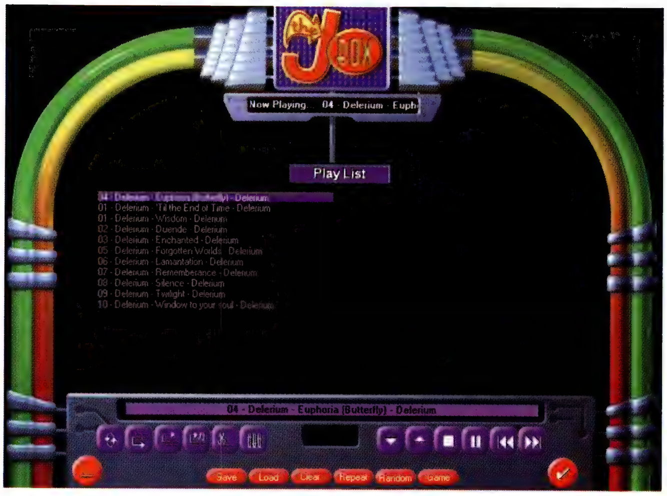
TIPS

Sound Settings

● If Napster's software is playing up on your system or you're having trouble connecting to their servers, Napster strongly recommends re-installing the client software on your PC. The idea here is that you then start afresh (presumably with the latest version), and things will happen as they should.

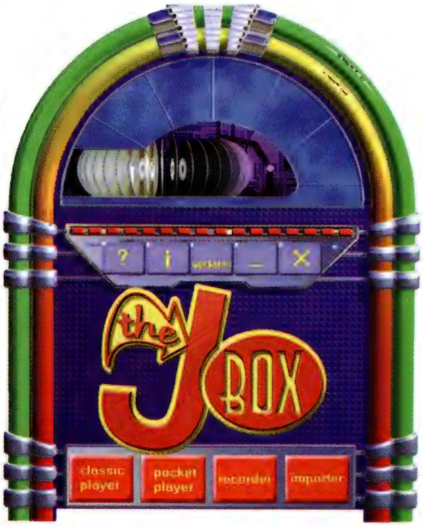
This is a pretty reliable - but hardly subtle - cure. However the re-installed program won't be as crispy-fresh as it should be, since it will pick up a number of registry entries left over from the past installation - namely, the old name and password data, plus other configuration details.

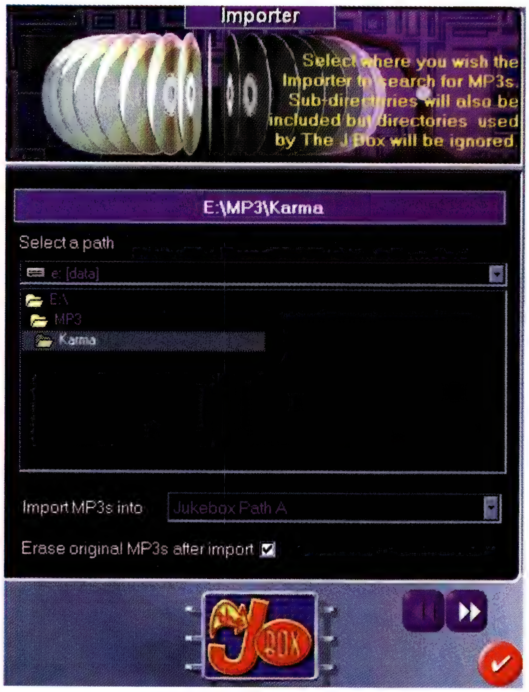
We'd recommend a truly fresh Napster installation if you're having strife, so those registry entries will need to be zapped once the existing client has been uninstalled - write down your name and password details first! You can then fire up Regedit, use its search facility to find and delete all the Napster key entries (back up the registry first). Reinstall Napster, and you'll then have a nice squeaky clean version, without preconceived ideas...



04 - Delerium - Euphoria (Butterfly) - Delerium
01 - Delerium - 'Til the End of Time - Delerium
01 - Delerium - Wisdom - Delerium
02 - Delerium - Duende - Delerium
03 - Delerium - Enchanted - Delerium
05 - Delerium - Forgotten Worlds - Delerium
06 - Delerium - Lamantation - Delerium
07 - Delerium - Rememberance - Delerium
08 - Delerium - Silence - Delerium
09 - Delerium - Twilight - Delerium
10 - Delerium - Window to your soul - Delerium

04 - Delerium - Euphoria (Butterfly) - Delerium





Select where you wish the Importer to search for MP3s. Sub-directories will also be included but directories used by The J Box will be ignored

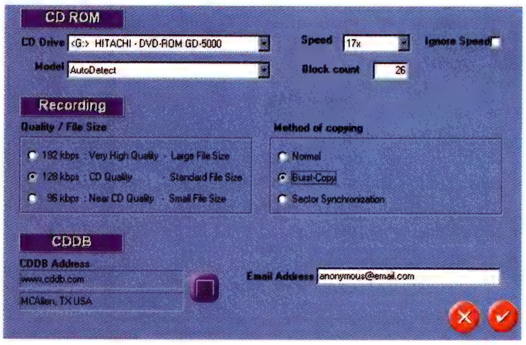
E:\MP3\Karma

Select a path: e: [data]

E:\
MP3
Karma

Import MP3s into: Jukebox Path A

Erase original MP3s after import ☑



CD ROM

CD Drive: <G:> HITACHI - DVD-ROM GD-5000
Speed: 17x
Ignore Speed ☐
Model: AutoDetect
Block count: 26

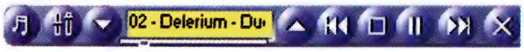
Recording

Quality / File Size
○ 192 kbps : Very High Quality - Large File Size
● 128 kbps : CD Quality - Standard File Size
○ 96 kbps : Near CD Quality - Small File Size

Method of copying
○ Normal
● Burst-Copy
○ Sector Synchronization

CDDB

CDDB Address: www.cddb.com
MCAllen, TX USA
Email Address: anonymous@email.com



02 - Delerium - Du

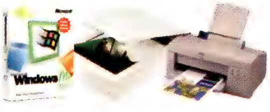
We liked:	All-in-one system manages everything Keeps your music organised
We didn't like:	Painful to drive
Price:	$43.95
Avaiable:	All good software houses and department stores.

The J Box is reasonably cheap commercial player and manager for all your MP3 files, and while it isn't the easiest application to drive, it does force you to manage your music.

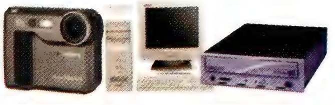
Before you can use the J Box, you have to run all your existing MP3s through the J Box's importer; this doesn't alter the file in any way, instead, it copies your music to a new set of directories that reflect the artist and album title. Once imported, the J Box will let you set up play lists, or play individual songs.

As well as the 1950s styled J Box (Jukebox) player there's a Pocket Player (that takes up a minimum amount of real estate on your desktop), and the J Box Recorder that will rip from CD and save the files away in the approved directory structure.

If the J Box is your first and only MP3 player, then you'll find it reasonably straightforward in operation, once you've read the user's guide. If, however, you have a whole pile of songs on your hard drive with little or no sorting, then you'll find the J Box's preoccupation with directories and sub directories a mite inconvenient. That, and its bubblegum interface mean that you may well choose to carry on using Winamp. In short, those of you who are happy to sort your entire collection into a multitude of artist/title directories will appreciate the imposed discipline; those who don't, won't. **ea**



INTERNATIONAL SOFTWARE WAREHOUSE



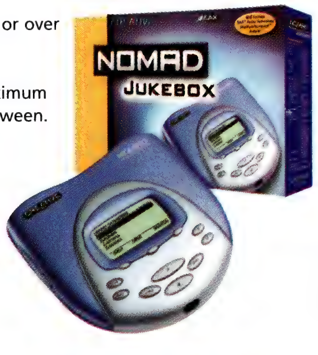
EVERYTHING FOR YOUR PC - DELIVERED AUSTRALIA WIDE

Creative Nomad JukeBox

150 CDs in the palm of your hand

With support for downloadable music formats such as MP3, WMA, WAV files and upcoming new formats, the NOMAD Jukebox provides a programmable, highly flexible portable audio solution.

- 6Gb HD stores over 100 hours of CD-quality audio, or over 150 CD's and thousands of personal playlist
- 400 grams lightweight device
- Choice of compression rate allows selection of maximum hours, maximum sound quality, or any point in between.
- Record direct via the 'line in' or microphone
- Connects to 4-channel surround sound systems
- Time scaling function allows you to control the playback speed - ideal for digital audio books, educational and musical applications.
- USB connectivity to PC or Mac for faster storage and retrieval
- Future proof Firmware upgradeable for future compression technologies and extended features
- SDMI and DRM complaint



Included accessories

Set of stereo headphones, two 4-packs of AA NiMH batteries, 1 universal AC power supply, 1 USB connector cable and a carrying pouch

$989.50

Websearch Code ....CRE075 Blue Nomad
Websearch Code ......CRE083 Silver Nomad

iomega HipZip™

NEW PRODUCT

Iomega™'s premier digital audio player

Features

- Anti-skip design
- Built-in lithium ion battery, which produces 12 hours of continuous play off one charge.
- Universal music file format which allows for support of both free and copyright-protected content.
- Supports MP3 and the new Microsoft Windows Media audio formats.
- Forward or reverse gets you to the track you want.
- High quality equalizer control system
- Drag and drop file transfer.
- Fast USB connectivity.
- Acts as external PocketZip drive – download or transport any digital information with ease.
- Carrying case, USB cable, headphones
- Two PocketZip 40 MB disks
- MusicMatch Jukebox CD Software.

$599.00

Websearch Code IOM144

IXLA PhotoEasy

So easy, anyone can be a great PC photographer

- Digital Imaging made fun, easy and affordable
- Easily download photos from the camera
- Catalog and manage your photos
- Share photos with friends & family over the Web
- Retouch and enhance photos - even fix red-eye!
- Warp, twist & stretch your photos for creative fun
- Create exciting custom calendars, postcards and more
- Includes the new Digital SuperPro 640 digital camera!

$209.00

Websearch Code IXL003

Maxi DVD-ROM 12X

Enjoy the high performance levels of Maxi DVD-ROM 12X!

Since the advent of the DVD standard, Guillemot has concentrated on offering you the ultimate generation in DVD-ROM drives. The greatest cinema studios and the most prestigious editors of PC games and multimedia applications are taking advantage of the extraordinary capacities of the DVD support today... so, do not wait until tomorrow!

- High speed DVD-ROM (12X) and CD-ROM (40X) drive
- Multiple supported formats
- Astonishing storage capacity
- Great Convenience

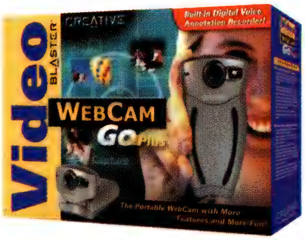
INCREDIBLE VALUE

$198.00

Websearch Code..........GUI016

Webcam Go Plus

Unleash your creativity with Creative's latest Video Blaster® WebCam® Go Plus



- Portable, can be easily detached from the PC's USB port to capture images.
- Features multiple modes to capture images in rapid succession or create short video clips when detached from the PC.
- Built-in 8MB of memory which stores in excess of 200 images at 640x480 VGA resolution or more than 400 images at 320x240 resolution.
- Allows for digital voice annotation to add thoughts to your favourite images.
- Lens and sensor improvements allow for brighter and clearer pictures.

$315.30

Websearch Code........CRE078

Sound Blaster Live! Platinum 5.1

NEW PRODUCT

Sound Blaster Live! Platinum 5.1 is the most complete Dolby Digital 5.1 surround audio solution for music, games and Internet entertainment.

FREE Games Included
• MDK II • Deus ex • Thief II

- Boasts the new Live!™ Drive IR for easy front panel connectivity to virtually any audio source, featuring a coaxial SPDIF input /output, MIDI input/output, line or microphone (Mono) input, and a headphone output with volume control
- Digital connection to multi-channel speaker systems
- Delivering 32-bit, 48kHz digital audio processing and playback. Provides superior digital sound quality with connection to digital multi-channel speakers
- Content creation software for MP3, MIDI, .wav audio
- Creative PlayCenter 2.0 lets you encode your MP3 songs (up to 320kbps) with superb multi-dimensional realism of Environmental Audio.
- Share your creations with friends on any MP3 player.

$480.15

Websearch Code........CRE079

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CD Music?
See D'Music!

THE IDEA OF AN MP3-CAPABLE CD player is not new. The *implementation* of the idea, on the other hand, is an awful lot newer. The Pine D'Music SM-200C is one of the more recent players on the market, and really is a nice piece of kit.

The SM-200C can handle CD-R or CD-RW discs, with up to 200 MP3s, and of course regular audio CDs as well. With ID3 tag support, the player displays title and artist of any MP3s it finds, making dealing with 200 tracks on one disk a practical proposition. The player has no problems with subdirectories, so you can slap in just about any CD bearing MP3s, and it'll find them for you.

The player itself is quite well-presented, with standard CD-player controls including intro, repeat and equaliser buttons. There's also a button to turn off the anti-shock buffering, but this serves very little purpose, as you can barely walk around with the unit with the buffering turned off. With the buffering turned on, you can make it skip if you try, but it's unlikely to happen in the normal course of events, unless you're involved in a contact sport of some description. The buffering is a little better in MP3 mode, as you might expect, but not as much better as the compression ratio would lead you to expect.

The equaliser settings are only available in MP3 mode, and are the usual mix of flat, classic, pop, jazz and extra bass — no surprises here. One minor annoyance is the fact that the player never tells you the filename of the song you're playing — if it doesn't have an ID3 tag, it's just listed as 'Unknown'.

What is severely lacking, though, is any kind of playlist feature. As it stands, the only way to find a song on the disk is to fast-forward through the list until you find it — you can skip through the list 10 files at a time if you want, but this doesn't help if you don't know where a song is. This is a pain, but is made up for by the information you do get out of the ID3 tags — compare this to a standard CD player, with only one hour of music, and no information at all.

All up, a nice little system, with nice features, good sound, and a nice price. (JBC)

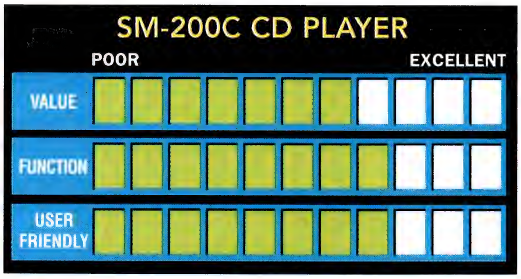
SUMMARY
- An MP3-aware CD player with ID3 tag support and anti-skip buffering

PROS
- ID3 support
- Plays anything

CONS
- No playlist
- Anti-shock could be better

RRP
- $349

AVAILABLE
- Go to www.bigshop.com.au.
Distributed in Australia by Jamsam Pty Ltd.



SM-200C CD PLAYER

POOR											EXCELLENT
VALUE	🟩	🟩	🟩	🟩	🟩	🟩	🟩	☐	☐	☐	☐
FUNCTION	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	☐	☐	☐
USER FRIENDLY	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	☐	☐	☐

World's Fastest
CD-R/CD-RW

CD RECORDING AT LightSpeed™

16 10 40
WRITE REWRITE READ

FAST

- 700 MB written in 5 minutes
- Re-writing of CD-RW discs at up to 10X
- Sustained maximum read speed of 40X
- CD Audio ripping at 40X (a disc in under 3 minutes)

SAFE

- 8 MB Buffer
- PurePhase Laser System™ reduces glare and errors by over 25%
- Improved reliability with Optimum Write Speed Control™ and wide media compatibility

PURE-PHASE LASER SYSTEM

NOW

- Available in E-IDE, SCSI, SCSI External and Firewire (IEEE1394) Kits from December 1

日経バイト NIKKEI BYTE Best of WORLD PC EXPO 2000 日経WinPC Editors' Choice

CRW-2100S VK Internal SCSI Kit

Save photos and videos	Store data and graphics files	Record your original music	Compile your favourite songs	Distribute files worldwide	Backup and archive information

NOTE

Actual performance of the CRW2100 is dependant on the Application software and recording media used.

CRW2100 is compatible with 16X media, & also compatible with lower specified discs at or above their recommended speed.

CD-RW speeds of 8X and 10X require discs bearing the COMPACT disc ReWritable logo.

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WEBSITE: www.yamaha.co.jp/english

SUMMARY

- A compact portable CD player with shock protection plus a 10 second audio buffer.

PROS

- Very compact and light in weight
- Anti-skip feature very effective
- Very good sound quality, strong bass easy to use

CONS

- Nothing serious that we could find

RRP

- $135

AVAILABLE

Dick Smith Electronics stores and dealers, or call the DSE customer enquiry/order hotline on 1300 366 644.

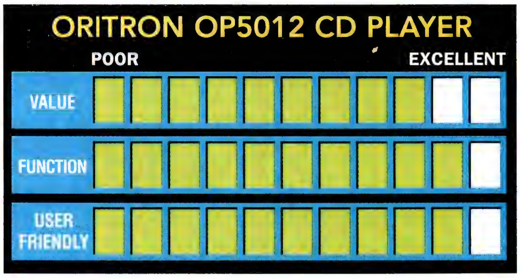
Music While-U-Walk/Jog/Jump

PERSONAL CD PLAYERS can't get much more compact than this, or more stylish. Oritron's OP-5012 is only a smidgeon larger than a CD itself, and less than 30mm thick once its stylish transparent blue lid is shut for playing your favourite disc. At a mere 325g (including two AA batteries) it won't weigh you down, either.

Features include 20-track programming, 'dynamic bass boost' (DBBS), a built-in 10 second music memory to prevent interruptions from track skipping, plus Advanced Shock Protection in the player's works. There's also a stereo line output, so it will happily drive a stereo hifi at home.

We tried out the Oritron while walking, jogging, pounding up and down stairs, and even bouncing on the spot. With the anti-skip function *not* turned on there were a few skips, especially with shocks along the laser pickup's sliding axis at about 10 o'clock/4 o'clock; but these virtually disappeared once we turned the anti-skip on. So it's pretty effective, which should make the Oritron good for joggers and other exercise freaks. The sound quality was fine, too, with the DDBS system ensuring good bass from the phones.

The Oritron comes complete with stereo phones in matching transparent blue, plus a mains plug pack for home or office listening. It's available from all Dick Smith Electronics stores and dealers, as catalog number A-5207. For more info check the DSE website at **www.dse.com.au**. (J.R.)



ORITRON OP5012 CD PLAYER

	POOR										EXCELLENT
VALUE	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	☐	☐
FUNCTION	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	☐
USER FRIENDLY	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	☐

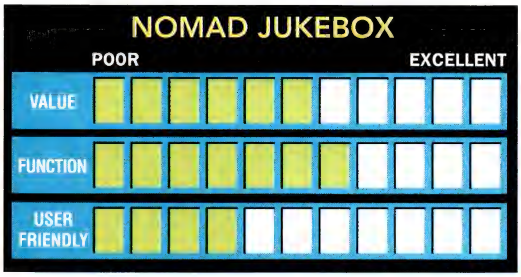
Three words: Six Giga Bytes...

THE MAIN LIMITATION in any MP3 player is of course storage capacity. The de facto industry standard of 64MB might get you through the day, if you don't mind a few repeats, but it's not exactly generous. Some recent players will play MP3s straight off CD, giving a huge 640MB capacity — that's 10 hours of non-stop music. The downside to these is that you need a CD burner if you want to put your own libraries together — involving a reasonably hefty outlay, and all the time and materials required to burn CDs. There had to be a better solution, and it didn't take Creative long to come up with it, in the form of the Nomad Jukebox.

The Nomad isn't exactly a subtle solution to the storage problem, but it's certainly effective — a 6GB hard drive sits at the heart of the system, providing more hours of music than you could possibly want in a portable player. With the storage solution beaten, and other cool features such as parametric EQ, surround sound, playback speed control, and more DSP settings than you can shake a stick at, in a box the size of a portable CD player, Creative didn't have to try too hard to create an unbeatable MP3 monster machine.

Unfortunately, this became a little obvious in places. The user interface is startlingly unintuitive, and makes using the thing more of an art than a science. Songs are automatically categorised by artist, title and genre — there's no way to simply browse the list of songs, you have to navigate through three layers of menus to find a single track. If your songs have blank ID3 tags, they get filed under <UNKNOWN>, but you still have to go through just as much button-pushing in order to find them. The DSP effects are also a little disappointing; all the settings except Normal sound decidedly flat unless you turn the bass up at by least 10dB.

Other than that, though, the system is indeed hard to beat — with a capacity of over 150 audio CDs, you can take your entire MP3 collection with you wherever you go — the ultimate geek toy and party-in-a-box. The software provided is sleek and capable, and at 300kb/s, the USB transfer rate is not to be sneezed at. (JBC)



SUMMARY

- A fully featured portable MP3 player with a 6GB hard disk for music storage.

PROS

- Massive capacity
- Surround sound/headphone spatialisation
- Time scaling
- Lots of DSP effects
- Audio recording (WAV)
- Fast transfer

CONS

- Atrocious user interface
- No way to browse all songs
- DSP sounds tinny without bass boost

RRP

- $1299

AVAILABLE

- Go to: www.australia.creative.com

Mow to the Music

WIRELESS HEADPHONES have been around for donkey's years really, with the transmission link (the bit to replace the wires) done with all manner of weird and wonderful systems — ultrasonic, infrared, RF, smoke signals, you name it and someone's had a crack at. An FM radio link system has to be the pick of the bunch though, as it wins hands-down in terms of connection reliability, range, and in most cases, sound quality.

If you're in the market for a set of decent wireless headphones, Philips — who have a fine history of producing quality audio components — currently have their sophisticated SBC HC480 set on offer for a reasonable $189.75 (RRP). These are a decidedly upmarket set of wireless phones, and offer lots of natty features like a self-adjusting headband, NiCad battery power (up 15 hours listening), auto-mute and power shutdown, automatic level control (ALC), and as you'd hope, a high audio quality.

Style-wise, they apparently won a European design award, but most of us agreed that you look like a bit of a goose wearing them - but then, that's a matter of personal taste. Whether you'd feel self-conscious in them while mowing the lawn or not, the sound quality, comfort and reliability all scored high points with us. You need to set the system up correctly to achieve the best signal to noise ratio (read the manual!), and once this is done the audio quality is impressive. There're comfortable too, thanks to the self adjusting headband and reasonably large ear pads. (R.E.)

SUMMARY

- High quality wireless headphones featuring a UHF FM link, NiCad battery power, built in charger and auto power shutdown.

PROS

- Very good sound quality.
- Comfortable.
- You can take a toilet break during Neighbours and not miss any dialogue.
- NiCad battery power. Charger in transmitter unit.
- Long range (up to 100m).

CONS

- You could be mistaken for Mr Spock when wearing them.

RRP

- $189.75

AVAILABLE

- Major electrical and hi-fi retailers

PHILIPS WIRELESS HEADPHONES

	POOR										EXCELLENT
VALUE	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	☐	☐	☐
FUNCTION	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	☐
USER FRIENDLY	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	☐	☐

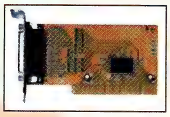
MicroGram Computers

Infra Red Link

Let your mobile phone, PDA, etc talk to your PC. We have a range of infrared devices that are compliant with the IrDA Standard.

Cat. 8941 Mother Board Connection	$89.00
Cat. 8421 Serial Port Connection	$99.00
Cat. 8923 USB Connection	$139.00

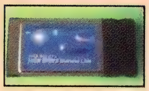
Low Profile Serial and Parallel Cards

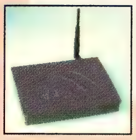


The newer ranges of PC's do not have serial and parallel ports and will not accept normal PCI interface cards. A new Standard has been established to specify the requirements of Low Profile interface cards to suit these computers. We now have a range of Low Profile cards as follows -

Cat. 2837 1 Port Serial	$72.00
Cat. 2838 2 Port Serial	$99.00
Cat. 2839 4 Port Serial	$TBA
Cat. 2840 1 Port Parallel	$85.00
Cat. 2841 2 Port Parallel	$119.00
Cat. 2842 2 Serial Ports & 1 Parallel Port	$117.00

Look Mum - No Wires & 11Mbps!





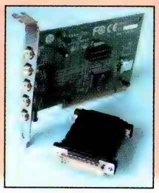
Scenario 1: Set up a LAN of wireless networked PC's. Connect notebooks and/or PC's in difficult to wire environments such as historic buildings or frequently changing environments in retail shops, etc.

Scenario 2: Provide access to corporate facilities such as email and data bases for mobile workers e.g. doctors and sales staff.

Scenario 3: LAN interconnection for point-to-point link e.g. building to building.

Cat. 11339 Access Point	$1,155.00
Cat. 11340 PCMCIA Station Adapter - Internal Antenna	$490.00
Cat. 11343 PCMCIA Station Adapter - External Antenna	$490.00
Cat. 11344 PCMCIA to PCI Adapter	$79.00
Cat. 11345 PCMCIA to USB Adapter	$TBA

Surveillance Cards



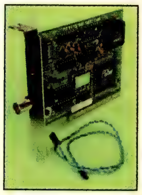
A PCI PnP card with multiple composite video inputs and is bundled with Multi-cam Remote Viewer software, Multi-cam Digital Surveillance System software and Multi-cam Backup System software. Features include:

- Adjustable recording frame rate for each camera, 1 frame/sec to 15 frame/sec.
- Zoom-in / Zoom-out function
- Brightness, Contrast, Saturation, Hue control settings.
- Programmable multiple detection zones for each camera.
- Motion-Detection and Recording / Storage of Video Data /Communication.
- Multiple Alarm Triggering mode.
- Alarm from speaker.
- Alert message call to your pager or phone call.

Available with 4, 12 or 16 camera inputs

Cat. 3429 4 Camera Input	$1,227.00
Cat. 3448 12 Camera Input	$3,499.00
Cat. 3449 16 Camera Input	$4,160.00

Watch Dog Timer Card



If your application program locks up, this card will apply a hardware reset to the computer after a selectable period. Utility software is included for DOS, Windows 3.1/95/98/2000/NT, OS/2 and UNIX.

Cat. 17070 PCI Controller	$299.00

Digital Television Signal Converters

These converters use digital processing to convert NTSC, PAL, SECAM or VGA television signals to NTSC, PAL, VGA. They also re-generate sync-pulse and can help stabilise poor quality video signals such as from multi-generation video tape.

Cat. 3451 NTSC PAL SECAM to PAL	$359.00
Cat. 3452 NTSC PAL SECAM to NTSC	$359.00
Cat. 3436 NTSC PAL SECAM VGA to PAL NTSC VGA	$499.00

Long Range Bar Code CCD Scanner Gun

This new long range CCD scanner is excellent and leads the field with 300 scans per second and a reading distance up to 280mm (depending on barcode). The decoding engine will decode poor quality bar codes that even lasers can't read! Let us prove to you how good it is!

Cat. 8919 Scanner Gun	$399.00
Cat. 8920 Stand	$ 49.00

PS/2 Keyboard & Mouse Adapter

Turns your notebook into a desktop with a single, pocket size adapter. It allows the use of a keyboard and a mouse from a single port!

Cat.15093 PS/2 K/board & Mouse Adapt.	$185.00
Cat.15094 USB K/board & Mouse Adapt.	$145.00

Dual Keyboard Adapter

Need input from two locations or need a specialized and standard keyboard? Here is the answer!

Cat. 15091 Dual PS/2 Keyboard Adapter	$119.00

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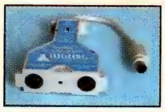
Dual Mouse Adapters



Use 2 Pointing Devices from 1 PC! Left & right handed mice, trackballs, touch pads, etc. Each has its strengths. Now you can maximize your computing experience by connecting your two favourites and switching instantly between them as you work.

Cat. 15090 Dual PS/2 Mouse Adapter	$145.00
Cat. 15097 Dual Serial Mouse Adapter	$145.00

Dual Monitor Adapter

The best way to attach two monitors to one computer. Not only does this adapter split the (S)VGA video signal, it boosts it for optimum image quality. It will support resolutions up to 1280 x 1024 and up to 32-bit color (4 billion colors). Perfect for presentations - use one monitor for the presenter and the other for the audience.

Cat. 15092 Dual Monitor Adapter	$239.00

The missing link

The Microgram 11808 audio-video RF link with infra red repeater allows you to send high quality colour video and stereo audio from one room to another and control the source with your existing remote *without wires*! Signal penetrates walls, doors, ceilings and floors with an A/V signal range of 100M. Three separate channels allows up to 3 transmitter/receiver pairs to operate simultaneously. Comes complete with 2.4GHz transmitter & receiver.

Cat. 11808 AV RF Link	$236.00

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Snap happy

IF YOU'RE IN THE MARKET for a high-end, professional multi-megapixel camera with all the bells and whistles, and don't mind paying a bit extra — you're reading the wrong review. The Kodak EZ-200 camera is cheap, cheerful, and extremely good at what it does.

Designed for quick and easy snapshots, this little camera is easy enough for anyone to use.

With a no preview display, no removable media and a maximum resolution of 640 x 480, the EZ-200 is the digital equivalent of those $10 disposable cameras; it fits easily in a pocket, you just point and click, and if a shot doesn't come out right, well no hassle, there's room for 63 more on board. That's a goodly chunk of snapshots, but if you're more concerned with quantity, you can switch to 320x240 mode and squeeze 128 photos onto the thing.

When you want to download your pics, you just plug in the USB connector, and fire up the TWAIN driver to import into any imaging application, or save all the files to disk at once. The driver software is a little clunky to use, and a couple of times couldn't find any pictures on the camera — this really needs fixing in the next version.

As well as single shots, the EZ-200 takes silent movie clips at 160 x 120 x 25fps, or 'burst mode' — 5 shots in a second, for fast action sequences. With the USB cable plugged in, it can generate streaming video up to 30fps at 320x240, compatible with Microsoft NetMeeting, and other video apps.

The camera comes bundled with ArcSoft's PhotoImpression and VideoImpression software. PhotoImpression is um, user-friendly, but VideoImpression is a very useful little video editor indeed. You can put together a quick little video in no time, and save it as a compressed MPEG — everything you need, really. Again, not high-end professional production, but perfect for the average user. (G.C.)

SUMMARY

- A compact user-friendly digital camera with USB interface.

PROS

- 64 (or 128) shots onboard.
- Very affordable.
- Small, light, sturdy.
- Takes video clips.

CONS

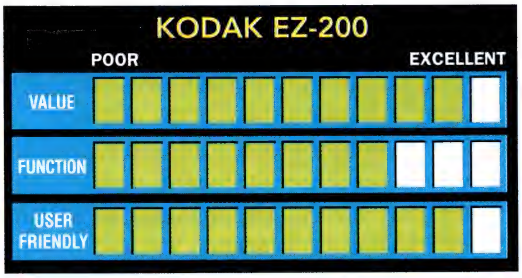
- No flash, needs good lighting.
- Picture quality could be better.
- TWAIN driver a little unfriendly.

RRP

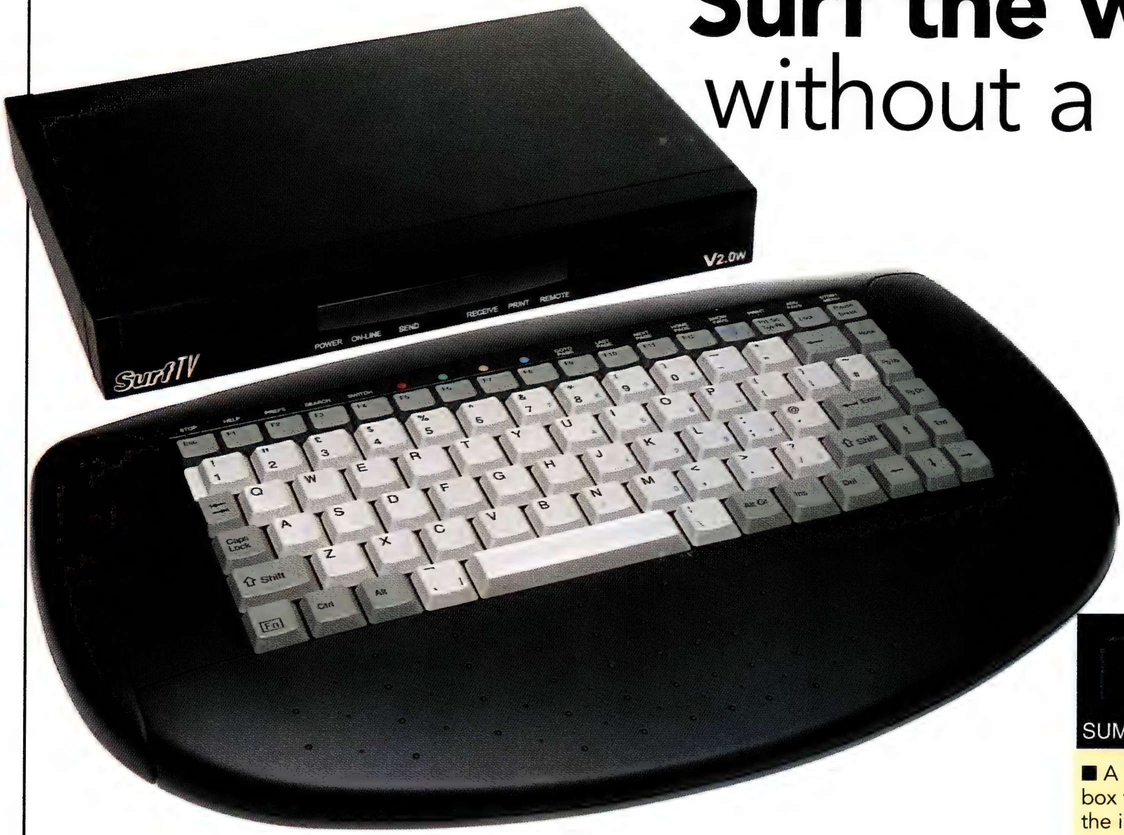
- $299

AVAILABLE

Call the Kodak information line on 1300 130 674



Surf the web without a PC!



WANT TO GET ON the Internet, but don't have a computer? Well, the Surf TV is made just for you. All you need are a SurfTV, a phone line and a television, and that's about it. It couldn't be much simpler really — all you do is plug the set top box into your TV or VCR, connect it to your phone line and you're away.

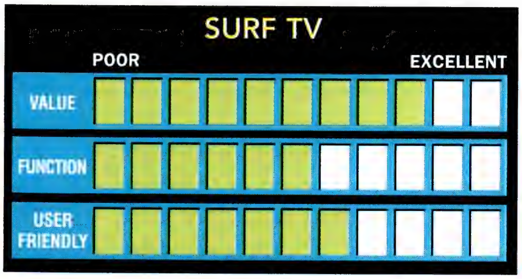
You will, of course, need an account with an ISP, which can be any company you like. Pre-paid accounts like Optus are good for occasional use, or you can go with the likes of FreeOnline or other 'free' ISPs. Whatever your choice, you'll need some account details that you type into the SurfTV, and then the world is your oyster.

Displaying a web page on a TV isn't as simple as it sounds, but the Surf TV does a pretty good job of it. Because TV screens aren't as precise as a computer monitor, there are some compromises that have to be made. First up is that everything is BIG. Text doesn't render very well on a TV screen (just look at the credits on a TV movie), so the answer is to bump up the text size and drop the screen resolution to around 640 x 480 pixels.

The second problem is that TVs are designed for displaying moving pictures, and so when it comes to showing static images (and text) things start to look a little fuzzy.

If you can live with that though, then the rest of SurfTV is nothing short of great. You can use either the remote control with its four-way button for navigating through the pages, or the infrared keyboard for sending emails and more serious surfing. With no wires between you and the set, you can relax on the couch with the world at your fingertips.

It's simple, it works, and even a technophobe could set it up. If you don't have a computer, then SurfTV is your best way to get on the Net. (G.C.)



SUMMARY

- A 'smart' set-top box that dials into the internet, while using your TV as a display and an infrared keyboard for navigation.

PROS

- Gets you the Net without a PC.
- Cordless keyboard is great!
- Simple to use

CONS

- You'll need to set up an account with an ISP
- Low-res text

RRP

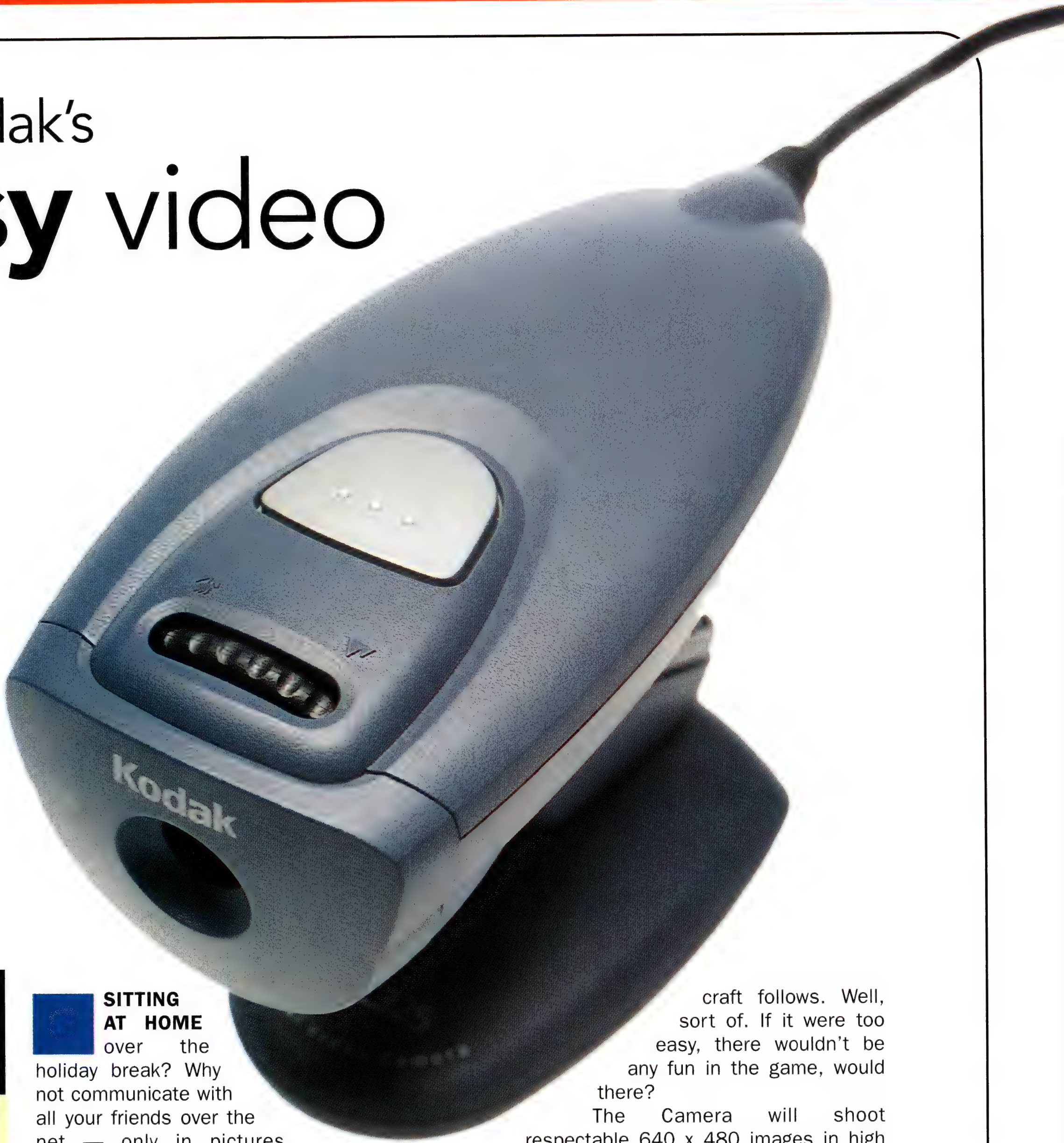
- $389

AVAILABLE

- Call:

1300 SURFTV or
1300 783 388
Web:
www.surftv.com.au

Kodak's
Easy video



SUMMARY

- A tiny digital video camera with 640 x 480 resolution and USB interface.

PROS

- Fully functioned
- Looks very Star Trek
- Lots of software support

CONS

- No Mac support

RRP

- $179

AVAILABLE

- Call the Kodak information line on 1300 130 674

SITTING AT HOME over the holiday break? Why not communicate with all your friends over the net — only in pictures rather than words.

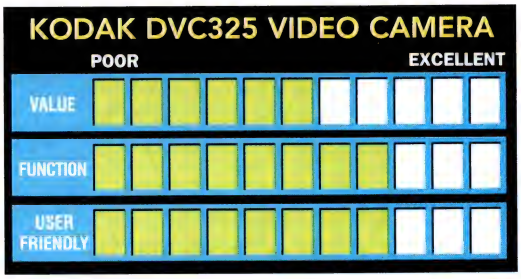
With the DVC325 Digital Video Camera from Kodak, you can take images or even MPEG movies of yourself relaxing, and email them to your hard working friends stuck at the office.

Of course there are far more serious applications for such a camera (such as videoconferencing), and with its USB interface, it suits laptops as well as desktop PCs.

Compatible with most standard videoconferencing software, the DVC325 comes with a laptop mount as well as a fully adjustable base that even sports a screw mount for a tripod mount.

Bundled along with the camera are some 'BodyGames' — PC-based video games that use the camera as the main user interface. These are quite fun to drive — lean left, and your spaceship moves left, lean right and the craft follows. Well, sort of. If it were too easy, there wouldn't be any fun in the game, would there?

The Camera will shoot respectable 640 x 480 images in high colour, and comes bundled with Microsoft's NetMeeting videoconferencing software, Presto! Photo and Presto! Videoworks video editing software, three-metre cable and Windows drivers. There's no Macintosh support though, so iMac users will miss out. A shame really, because it's a great camera — and looks the part too. (G.C.)



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CD Video Recorder

How would you like to be able to transfer your home video recordings onto video CDs, where they'll last a lot longer without deteriorating? With the new Terapin CD Video Recorder, you can do just that; it's like a CD-based VCR. As an added bonus it'll also make full CD-quality audio discs, and digital copies of audio CDs. **by Jim Rowe**

SUMMARY

- A consumer level video and audio CD recorder.

PROS

- Records PAL or NTSC video on standard CR-R or CD-RW blanks.
- Delivers very close to VHS picture quality.
- High quality CD audio recorder and player as well.
- Has optical and coaxial inputs for audio CD recording.

CONS

- Only records audio discs on 'audio' CD-R or CD-RW blanks.
- MPEG-1 video recording does have limitations.
- Buttons tend to jam on the remote control.

RRP

- $1499

AVAILABLE

- Skywave Electronics Australia, 4 Enterprise Place, Wetherill Park NSW 2164. Phone (02) 9756 0030, fax (02) 9756 0040 or visit their website at www.skysonic.com.au

IT MIGHT LOOK a bit lumpy and ungainly, like its amphibious namesake, but the Terapin has some nice surprises under that transparent plastic carapace. It's claimed as the first consumer-level Video CD recorder, designed to make video recordings on CD easily and from any standard source of video: a VCR, a camcorder (analog or digital), a TV set or pay TV set-top box, even a DVD player.

For making video recordings it has inputs for both composite and S-video, along with stereo (analog) audio. So as a video recorder, it's more or less the equivalent of a stereo VCR. The main difference is that it uses CD-R or CD-RW blank discs instead of tapes, and records both the pictures and stereo sound on these digitally. (You can only record on CD-R discs once, of course, as the recording becomes permanent. If you want to be able to erase and re-record, you need to use a CD-RW disc.)

OK, so that's the basic idea; now a bit of clarification. First of all, the Terapin *isn't* a DVD recorder. It records on standard blank CDs, and according to the 'Video CD' specification. This is an older technical spec than the one used for DVDs, and can't deliver the same picture quality. It uses MPEG-1 video compression rather than the improved MPEG-2 compression used for DVDs, meaning that the best picture quality it can deliver is roughly on a par with VHS tapes.

You can't have 5.1-channel Dolby Digital surround sound, either, but you *can* have two-channel stereo and Dolby Pro-Logic analog surround sound. Which can still be pretty good, of course.

Oh — one further limitation. Although prettywell all current DVD players can play Video CDs of the commercial 'pressed' type, they *can't* all play video CDs recorded on the Terapin or any similar CD recorders that may appear. That's because some DVD players can't play these CD-R or CD-RW discs, where the recording is in a coloured dye layer rather than in pressed 'pits'. Generally the only DVD players that *will* play them are those with dual pickup lasers — which is a fair percentage, but by no means all. So if your DVD player isn't in this category, you'll need to use the Terapin itself to play back its video recordings.

On the plus side, though, the Terapin can also make full-bottle audio CD recordings, on 'CD-R audio' and 'CD-RW audio' blank discs. For this it provides not only the analog stereo inputs, but both kinds of digital bitstream input (optical and coaxial) as well — so you can make direct digital copy recordings from your DVD player or high-end CD player. There's even a coaxial digital output too, for monitoring the recording via an external decoder.

Here again I should probably mention that with the digital audio inputs, the Terapin will only accept stereo or mono bitstreams at the standard CD sampling rate of 44.1kHz, and with linear PCM coding as used on CDs. It can't cope with the 48kHz from DVDs, or with a Dolby Digital bitstream.

Getting back to recording video signals, another bonus feature of the Terapin is that it can automatically convert NTSC video (from a US laserdisc, for example) into PAL, during recording. In fact you can use it as a video standards converter even when you're not recording, as long as there's a blank CD in the tray. Handy!

Other interesting features of the Terapin include a 'CD Synchronise' facility (both single track and full disc) for when you're making copies of audio CDs, a setup menu that appears on the screen of your TV or video monitor, and the ability to erase either a full CD-RW disc or just its table of contents. Of course it's also a playback deck for both video and audio CDs, as well as a recorder, and you get a raft of playback functions — including slow-motion playback of video CDs at 1/2, 1/4 or 1/8 normal speed.

Not surprisingly the Terapin comes with its own remote control. This has all the control buttons needed, although some are under a slightly awkward sliding plastic cover in the same colour as the Terapin's carapace.

What we found

The Terapin is fairly solidly made, although the curved front panel seems a bit flimsy in the lower centre. The legends under most of the control buttons are not as easy to read as they might be, either, printed as they are in light silver on a panel that's only a slightly darker shade of silver.

On the other hand a few quick checks with the instruments showed that as an audio CD recorder and player, the Terapin works fine. The frequency response was only 0.1dB down at 20Hz and 1.25dB down at 20kHz, with good channel balance and linearity down to -80dB. The unweighted signal to noise ratio was just on 89dB, too, and the square wave response showed low overshoot and well-damped ringing. So one way and another there's no cause for complaint about the quality of any audio CDs or copies it makes — or its ability to play them.

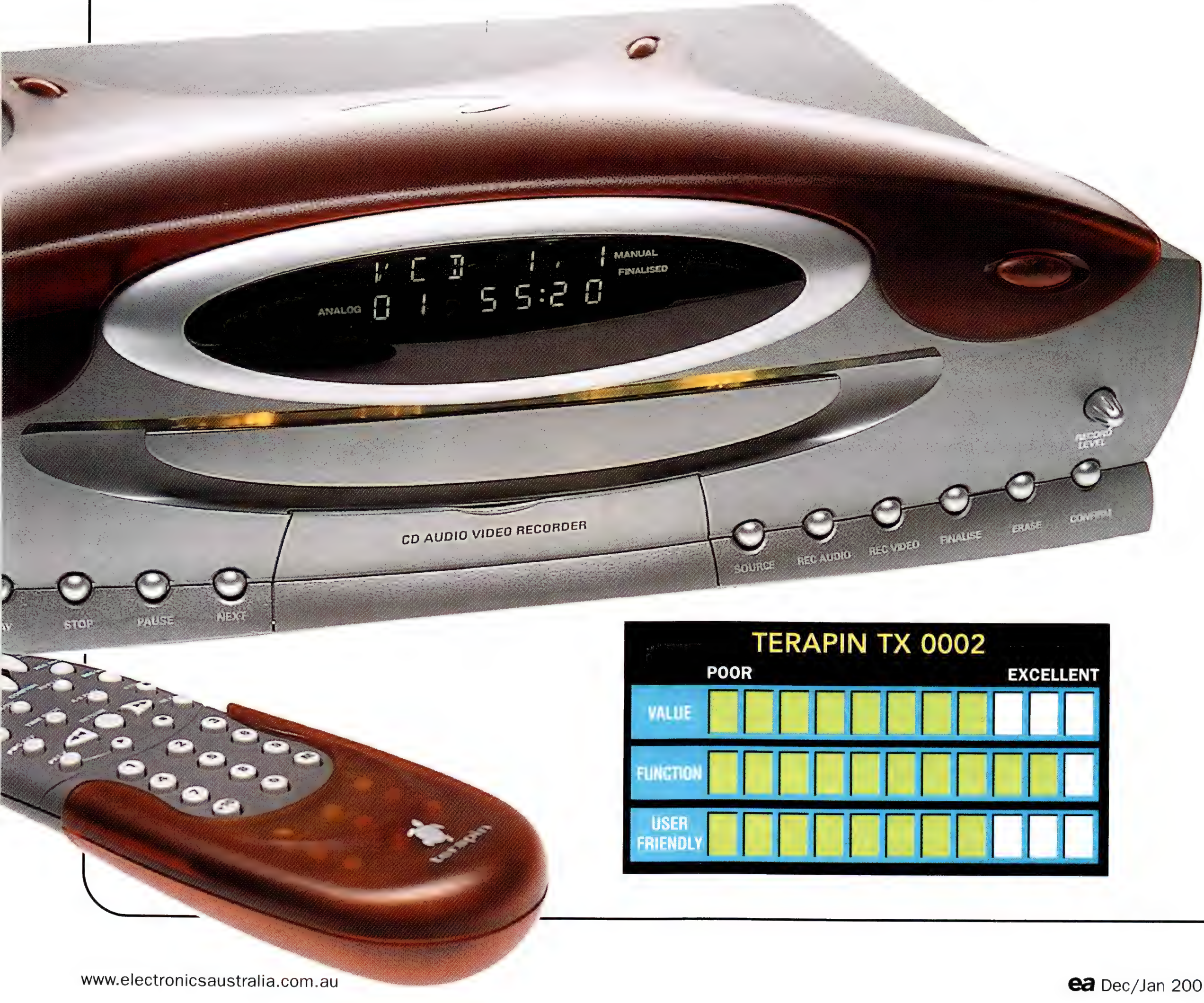
Of course the Terapin's main claim to fame is as a video recorder. To check its performance in this regard I tried making recordings of selected scenes from a few familiar laserdiscs and DVDs, using the S-video input. I also tried recording scenes from videotapes, using the composite video input. In both cases the results were quite impressive, too.

Although MPEG-1 can't deliver the picture definition that we're all getting to expect from DVDs, the picture quality of the Terapin's recording from a good S-video source was clean and very stable, with no discernable colour bleeding. True it was noticeably 'softer' than the original (especially from DVD or laserdisc), but nevertheless quite viewable on screens of 68cm or smaller.

Of course the other main limitation of MPEG-1 is its lower ability to cope with a lot of 'unpredictable' image motion, like the leaves of a tree in the wind, or flames from an explosion. So inevitably some 'blocking' was visible in a few such scenes that I tried it with; but to be fair, this effect can occur even with indifferently encoded DVDs.

Overall I found the Terapin fairly easy to drive, although at times it seems a bit tardy to respond to your presses of the control buttons. It's also a bit slow to get under way with recording, which can result in missing a few seconds at the start of a recording. The user manual isn't all that easy to follow in places, either.

But despite these minor gripes, the Terapin *does* let you make very acceptable digital video and audio recordings on CDs. So if you'd like to transfer some of your precious family video movies to a more durable medium, it would be just the shot. **ea**



TERAPIN TX 0002

	POOR										EXCELLENT
VALUE	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	☐	☐	☐
FUNCTION	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	☐
USER FRIENDLY	🟩	🟩	🟩	🟩	🟩	🟩	🟩	🟩	☐	☐	☐

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Pioneer's DV-636D

'With the Lot'

It delivers all three types of video output, has inbuilt 5.1-channel surround sound decoding for DTS as well as Dolby Digital, can play MPEG sound tracks as well as 24-bit 96kHz LPCM in stereo, and is quite happy playing CD-R discs as well as normal pressed DVDs and CDs. What more could we want in a DVD player? **by Jim Rowe**

OVER THE LAST two or three years, I've had the opportunity to evaluate over a dozen different DVD players. These have covered a pretty wide range — from early models with quite basic functionality, to high-end models with superb performance and breathtaking price tags to match. More recently there have been the newer economy models, providing surprisingly good performance for lower-than-ever prices.

Many of these models have delivered excellent performance in terms of basic image and sound reproduction; and quite a few have also offered some really worthwhile 'bonus features'. But frankly I can't remember *one* that didn't also turn out to lack at least one facility, and as a result seemed to leave me a little unsatisfied on behalf of potential buyers.

In short, until now I haven't come across a single DVD player at any price level which seemed to provide 'the lot' — excellent basic performance plus all of the main bonus features and functionality. Until this month, when I had the opportunity to try out Pioneer's new DV-636D player...

DVDP

Built-in Dolby Digital & DTS Decoder
Dolby Digital / DTS Decoder
Component Video Output
Acoustic Damper Tray
DVD VIDEO
ACOUSTIC DAMPER MECHANISM
TruSurround

***It's cleanly** styled in 'champagne gold', but there's a lot more to it than a pretty face. Just about all the features and facilities you're likely to need, in fact.*

The DV-636D seems to be at the top of Pioneer's latest range, and shows every evidence that the designers listened to reviewers' complaints about missing features on earlier models (from all manufacturers, of course, not just Pioneer), and made sure we couldn't complain about *this* one. It certainly seems to have everything you'd want.

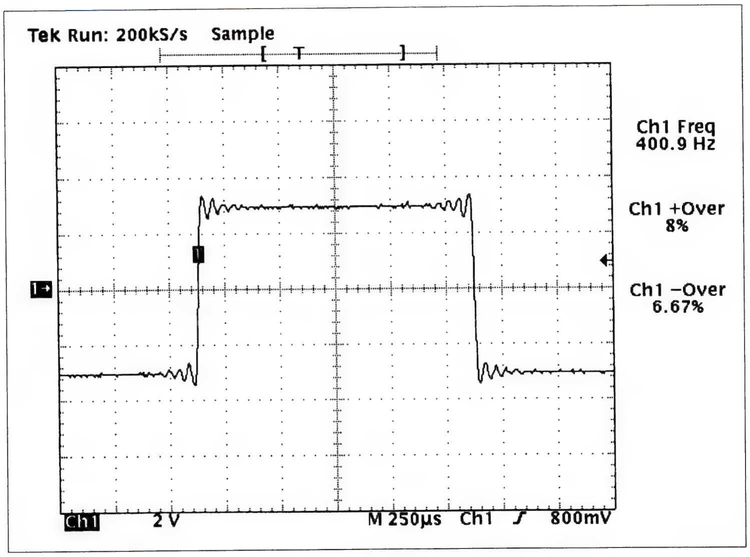
For a start, you get not only composite and S-video outputs (two of each, in fact) but a set of component video (Y/Pb/Pr) outputs as well, to achieve the best possible image quality with TVs and projectors capable of using them. You can't use the component video outputs at the same time as the composite/S-video outputs — there's a switch on the back panel to select one or the other — but that's fine; you really wouldn't want to watch both together anyway.

Then there's the surround sound decoding. Here you get not only inbuilt decoding for Dolby Digital tracks, but the same for DTS tracks as well — both in up to 5.1 channels and emerging from the usual six RCA connectors. This is quite apart from the usual mixdown stereo outputs, which in this case deliver stereo audio from all four possible types of DVD track: Dolby Digital, DTS, MPEG2 and LPCM. (The same outputs also deliver stereo from the LPCM tracks of audio CDs, of course, and the MPEG1 tracks of video CDs.)

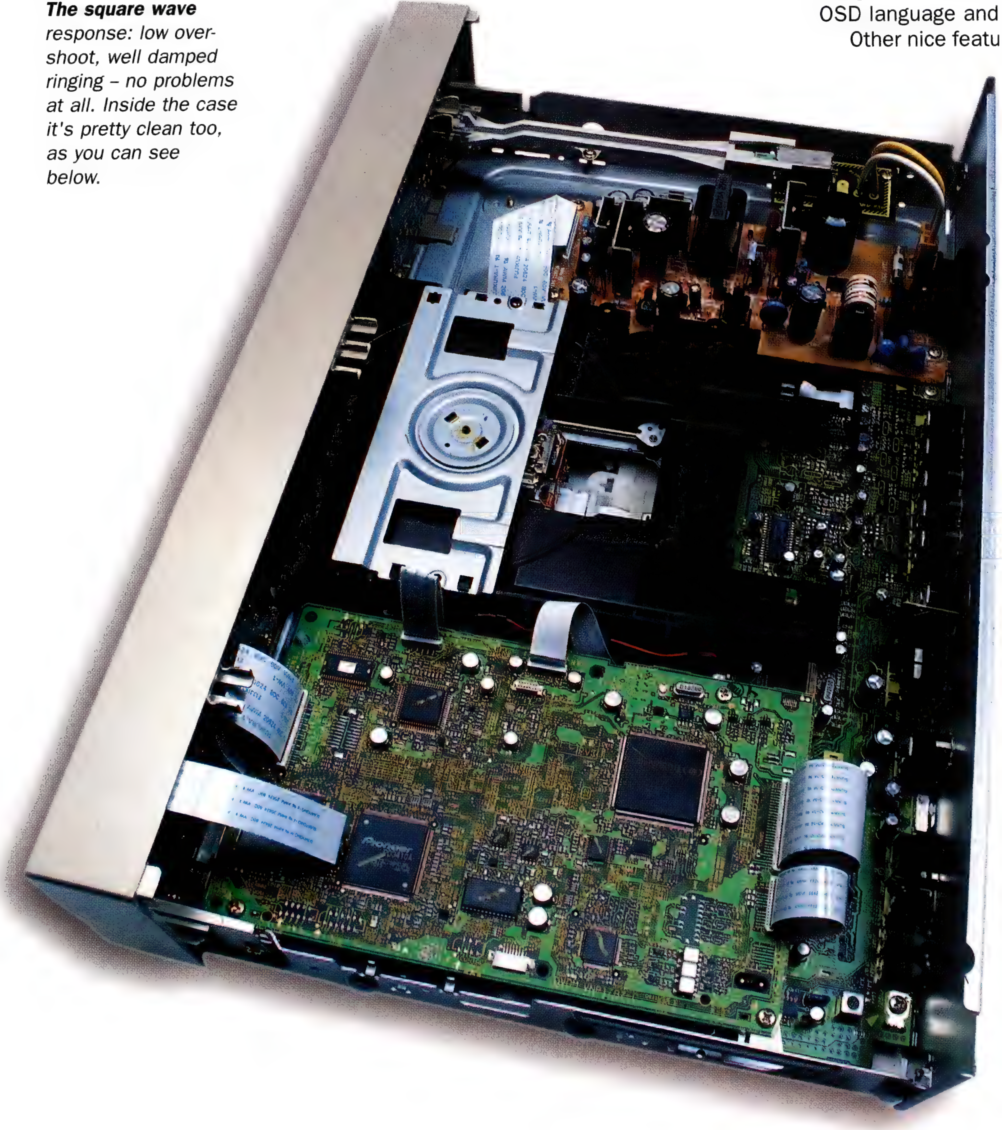
There's even built-in DSP processing for TruSurround and Virtual Dolby Digital 'virtual surround' modes, so those with only a stereo amplifier and speaker system can still achieve a reasonably satisfying surround sound effect.

What about digital bitstream outputs, to drive external decoders and DACs? These haven't been forgotten either. There's both optical (TOSlink) and coaxial (S-P/DIF) outputs, for full flexibility. The player can even convert Dolby Digital and MPEG1/2 bitstreams into LPCM stereo, in case you have a high quality external DAC which can only handle this format — just to be even more helpful.

With an eye on the future, too, it can handle 24-bit/96kHz sampled LPCM bitstreams and output these either unchanged or downconverted to 48kHz, to match



The square wave *response: low overshoot, well damped ringing – no problems at all. Inside the case it's pretty clean too, as you can see below.*



the capabilities of external decoders. The inbuilt DACs seem to be able to handle 24-bit/96kHz LPCM stereo as well.

As you can see, Pioneer's designers have covered pretty well all the bases. The DV-636D even plays CD-R and DVD-R discs happily as well as standard pressed discs — clearing another hurdle where many other players stumble.

Anything else? Well, there are quite a few features that are perhaps less spectacular, but very worthwhile nonetheless. For example the setup menues are particularly flexible, yet surprisingly friendly due to a two-tier beginner/expert 'navigator' system; you can adjust virtually every aspect of player operation, including image aspect ratio and TV format (NTSC/PAL/AUTO), OSD language and its position on the screen.

Other nice features include smooth frame-advance still playback with four different speeds, in both forward and reverse; a Last Memory function to allow resuming playback of a disc that has been removed from the player; two control jacks so the player can be linked to a Pioneer amp or receiver, for integrated system control; and redesigned standby circuitry, so the player draws less than 0.9W in standby mode for energy conservation.

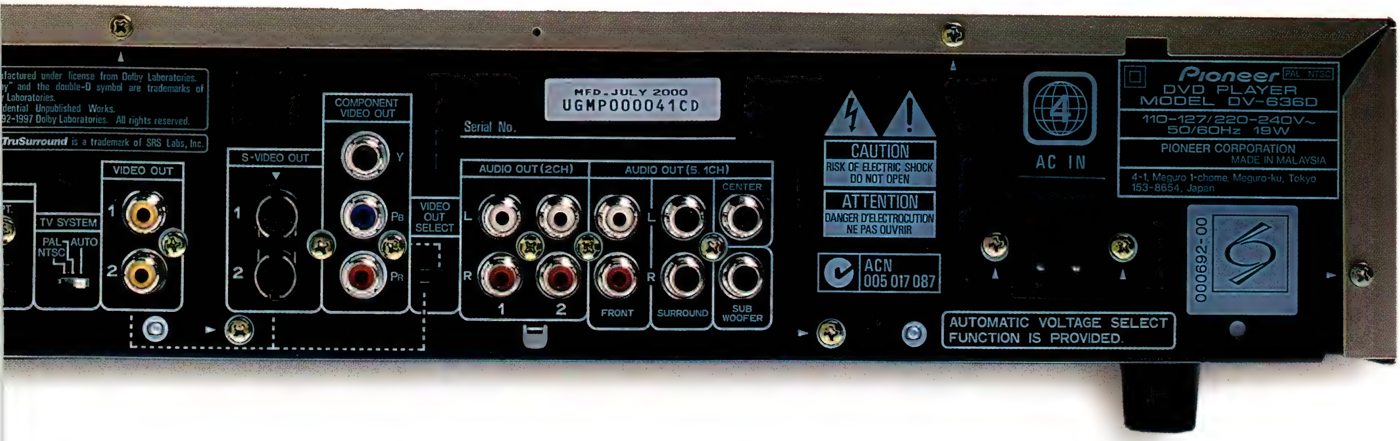
All this in a cleanly styled case 420 x 288 x 104mm, finished in lightly burnished 'champagne gold'. The remote control is in black, fairly slim and reasonably intuitive in operation.

What we found

First off I ran the instruments over the sample DV-636D using our standard test CDs, and the results were quite impressive.

The frequency response was virtually ruler flat from 20Hz to 10kHz (within +0/-0.05dB), drooping quite slowly beyond that range at both ends to reach only -0.35dB at 6Hz and 20kHz respectively. The channel balance was also excellent, being within 0.05dB over the full range.

Similarly the fade-to-noise test showed that replay linearity was fine down to -90dB, while the signal to noise ratio was just



Look for *a rear connector, and it's there. You can't use the component video outs at the same time as the others, but you wouldn't want to anyway...*

on 125dB with the player powered via a mains isolating transformer (or around 94dB without it).

Even better, the total harmonic distortion figures were less than 0.005% for frequencies of 3163Hz and below, and rose to only 0.045% at 20kHz — showing very low jitter and a commendably low level of alias components in the output.

This performance suggests well designed post-conversion filtering, which was further supported by the square wave and pulse tests — showing less than 8% over- and undershoot, and nicely damped symmetrical ringing.

Encouraged by this very impressive basic audio performance, I tried checking the video side with the player feeding our Sony projector, and using the Video Essentials DVDI 0711 test disc. Here I discovered a lurking problem with the sample player: its composite and S-video outputs seemed to be delivering distorted output, with a severely limited greyscale and colour range.

Luckily, though, the component video outputs were working correctly so this still allowed me to check the basic video performance. The tests revealed a horizontal resolution of at least 475 lines and 5.75MHz, and a 'moving Fresnel zone plate' pattern which was particularly clean and free from colour artifacts.

In short, the testing showed the basic audio and video performance of the DV-636D to be excellent, despite the video downmixing problem evident with the review sample.

Finally I hooked the player's audio outputs up to our surround sound system, and checked out both the stereo and surround sound performance with our usual reference CDs and scenes from well-encoded movie DVDs. This was using both the digital and 5.1-channel analog audio outputs by the way, to allow easy A-B comparison.

The stereo LPCM reproduction via the player's internal DACs turned out to be very clean and enjoyable, with smooth tonal balance and stable stereo imaging. So like the best of the latest DVD players, the DV-636D makes a really excellent CD player.

I was also very impressed with its performance as a DVD player, using either the internal surround decoding or that in my receiver (a Pioneer VSX-D508, as it happens). The player's decoder gave very satisfying surround steering in chapter 12 of *Dragonheart* for example, and also in chapter 2 of *Armageddon*. Both of these scenes have dramatic 5.1-channel encoding, and are therefore very revealing in terms of decoder capability.

A few dramatic scenes from other movies were tried as well, and all showed that the player's Dolby Digital decoding delivers very 'full bodied' and satisfying surround sound.

Happily I was also able to try out the player's inbuilt DTS decoding, by playing tracks from a recently released test DVD: Unapix's *The Ultimate DVD Platinum* (UPX72012), which plays in all regions. This confirmed that the DV-636D performs just as well for DTS as it does for Dolby Digital. Mind you, at the time of testing there were still no region-2 movie DVDs available with DTS encoded sound tracks. Still, the first is actually due for release in December by Columbia TriStar: the deluxe Collector's Edition of *Gladiator*. Perhaps there'll be more to follow next year.

The Unapix test DVD also allowed me to try yet another aspect of the player's capability: its ability to play LPCM stereo audio with 24-bit sampling at 96kHz. Here again it passed with flying colours, although I must confess my 61-year-old ears really can't hear much improvement compared with 44.1kHz 16-bit sampling.

Summarising, then, Pioneer's new DV-636D DVD player not only provides virtually every feature we reviewers have complained about when they've been missing on other players, but also achieves a commendably high level of picture and sound performance into the bargain. That's quite an achievement, and certainly lifts the player into the top bracket of current models.

Although the DV-636D isn't cheap at $1099, this combination of performance and features still makes it very good value for money. I suspect you have a winner here, Mr Pioneer! **ea**

SUMMARY

- A high-end DVD/CD player with just about all the trimmings.

KEY FEATURES

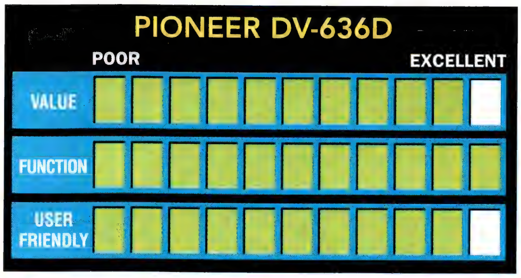
- Built-in Dolby Digital and DTS surround decoders
- Component video, S-video and composite outputs
- Plays CD-Rs as well as pressed DVDs and CDs
- Plays MPEG tracks, as stereo
- Standby power less than 0.9W

RRP

- $1099

AVAILABLE

- Pioneer AV dealers, or contact Pioneer Electronics Australia on 1800 338 439.



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Cat. SL-2983 **$99**

MILLENIUM LIGHT CHASER

Cat SL-2948

This great new product utilises 6 different coloured lamps and features a strobe with variable speed control, spotlight, multi-directional chase sequencer, sound modulator with variable sensitivity control, Infrared remote controller, neat little stand, and status indicator. Onboard electret microphone for audio input or direct line level RCA socket. Supplied with required AC plugpack. Ideal for DJ and party uses. Size: 600 x150x85mm **$149**

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New model.
Black in colour.
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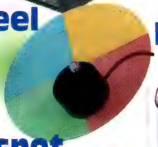
Colour Wheel for Par 36



Cat. SL-2961
$27.95

Par 36 Pinspot

240V operated.
Globe not incl.
Par 36 Lamp
SL-2964 $9.50
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BATTERY POWERED
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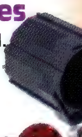
$19.95

Three Way Linkable Light

This is a musicolour, with coloured spotlights flashing to the music. Controller will take up to 6 light modules. Includes 3 globes.
Cat. SL-2950 **$115**

Extra Modules



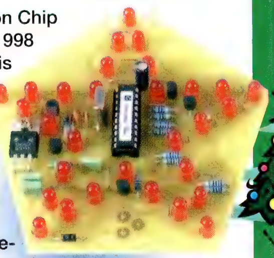
Globe not supplied.
Cat. SL-2952
$19.95ea

GLOBES

Cat. SL-2953	Orange
Cat. SL-2954	Purple
Cat. SL-2955	Red
Cat. SL-2956	Green
Cat. SL-2957	Blue
Cat. SL-2958	Yellow

$6.95ea

Christmas Star Kit

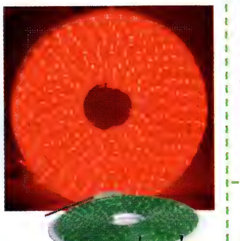


Refer: Silicon Chip November 1998
This fun kit is a micro-processor controlled array of 30 LEDs in the shape of a star. The pre-programmed microprocessor generates over a dozen fascinating patterns for eye-catching christmas decorations. 30 premium red LEDs, pre-programmed micro plus all electronic components. This is a PIC project.
Cat. KC-5253 **only $29.95**

LED Star Lighting

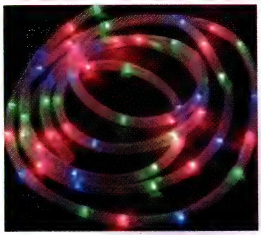
20 metre wiring harness, with 120 LED lamps spaced at 6 to a metre in colours red, green and yellow. Includes controller with 8 different flashing sequences - chase, twinkle, slow fade, sequential etc. Includes main AC Adaptor. Cat. SL-2840 **$39.95**

Chasing Ropelight - 8 Metres Long



Available in 5 colours. 8 metres long and 240V operated. Includes controller with 8 different lighting patterns. Rope dia. 13mm. 288 bulbs spaced at 28mm. Rope is waterproof, but controller and mains plug are not.
Red SL-2821; Green SL-2822;
Light Blue SL-2823; Yellow SL-2824
Clear SL-2825 **Only $69.95ea**

'ICE' Ropelight



This is a clear frosted ropelight, with coloured bulbs - red, yellow, blue and green inside. Rope is 17mm dia., and 10mtrs long. Looks like lights under ice! 180 bulbs in all. Includes controller with 8 distinct patterns.
Cat. SL-2820 **$61.15**

'Twinkle' Lights

Amazing effect. 2 types available - Candlelight gold colour or colour (red, yellow, blue, green) bulbs. 5 metres long master bundle bonded together. Built in controller provides a shimmering effect as well as other effects. Mains operated.

CANDLELIGHT GOLD	Cat. SL-2830
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Cat. XC-1000

CUSHION

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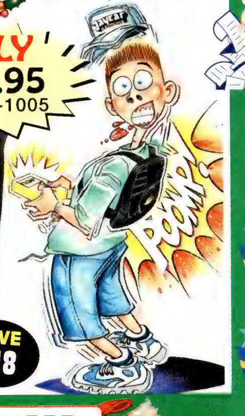
Cat. XC-1005

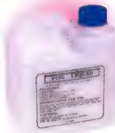


Some of the cartons are slightly scuffed, but the contents inside are perfect!

Fog Machine

Our fog machine produces clouds of white fog on demand and has a remote fog control switch and is an excellent companion to our mirror balls and party lights.
Cat AF-1200 **$165**

Fog Juice



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BONUS 1 - FREE STEAK KNIVES

These classic look stainless steel knives are terrific and will be the showpiece in any cutlery drawer.

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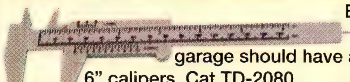

Every desk, toolbox or garage should have a set of these 6" calipers. Cat TD-2080.

*The $100 ($250) must be spent at one time, on one visit and the bonus must be requested at the time of purchase and only one bonus available per visit.

Velleman 5mhz Scope

This portable oscilloscope is about the same size and price as a good multimeter.

Its high sensitivity - down to 5mV/div - and extended scope functions make this unit ideal for hobby, service, automotive and development purposes. It's ultra fast full auto setup function, makes measuring waveforms very easy.

SOME FEATURES: •High contrast LCD with wide viewing angle •Full auto set up for volt/div and time/div •Trigger mode run - normal - once - slope -/+ •True RMS and dB measurements •Readout: Vdc - Vpp - Vrms - dBm

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Digital Multimeter with: •Sound Level (SPL) •Light (LUX) •Humidity •Temperature

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DONT PAY $109

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•Auto Ranging •Temp •Capacitance •Buzzer •Transistor Test •Back Lit •Diode Test •Holster •Carry Case •Data Hold

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Cat. QM-1440 **Was $69.95**

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In the June '99 issue of an English magazine "Auto Express" they tested 7 different Tacho Dwell Meters. THE WINNER WAS OUR VERY OWN QM-1440. "WAY OUT IN FRONT WAS THE DIGITECH, WHICH IS PERFECT FOR DIY MOTORISTS AND IS SOMETHING OF A BARGAIN". Both well made & well featured. It comes with a strong flexible case & is large enough for easy operation but without the bulk which would hinder proceedings. Its comprehensive design has everything the motoring DIY-er could need".

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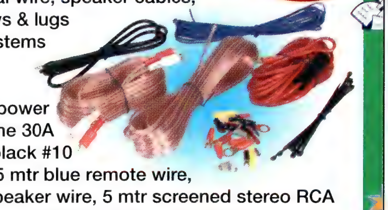

This kit has all the electrical wire, speaker cables, connectors, screws, screws & lugs required to install most systems and will support power ratings up to 100 watts.

Contents: 5 mtr red # 10g power cable with inline 30A fuse, 1.2 mtr black #10 power cable, 5 mtr blue remote wire, 10 mtr clear speaker wire, 5 mtr screened stereo RCA cable, plus an assortment of screws, connectors etc.

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This unit measures 184cm long & 141cm high. It features Santa in his sleigh loaded with presents. Colours red, green, blue, white & yellow. Power consumption 755W 240VAC. 8 metre power cord. Sturdy metal frame with mounting lugs. Cat. SL-2900

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MERRY XMAS

Measuring 213cm wide by 101cm high. The Merry Xmas motif is rendered in an attractive 'script' writing style in a scarlet red. Two yellow white stars provide an attractive highlight. Power consumption 410W 240VAC. 8m power cord. Sturdy metal frame, mounting lugs. Cat. SL-2902

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Measuring 2.6 metres long by 57cm high. Santa is seen riding his sleigh pulled by two trusty reindeer. Attractively coloured scene. Power consumption 574W 240VAC. 8 metre power cord. Sturdy metal frame with mounting lugs. Cat. SL-2904

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Measuring 133cm high by 111cm wide. It features a green tree in the classic style with 3 contrasting red decorations. You can also add real decorations to the tree. Power consumption 410W 240VAC. Sturdy metal frame. Cat. SL-2906

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ATTRACTIVE FESTIVE STARS

Attractive 6 pointed stars in four different colours. Sold per each.
RED Cat. SL-2930
GREEN Cat. SL-2932
BLUE Cat. SL-2934

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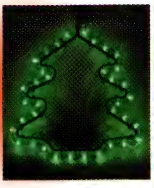
Large Indoor X'mas Lighting

MERRY CHRISTMAS

Features the full wording of the dedication in red in an attractive handwriting script. The decoration is enhanced with two birds in flight above & below the writing. Sturdily framed for years of service. Ideal for restaurant windows etc. Power consumption 66W 240VAC. Size 57x52cm. Cat. SL-2910

$79.95

CHRISTMAS TREE



Attractive green classic shape 33cm high x 26.5cm wide. Ideal indoor/window illumination, designed to be garlanded with real x'mas decorations or as part of an overall christmas effect. Cat. SL-2938

$20.35

Sound Synthesizer LAB with Voice Recording / Playback

This kit is based around a voice IC chip and allows you to connect circuits together to send, record and play back messages. You can also create alarms that use the sound of your own voice. Springs are used to hold the components. Comes with user manual with 50 projects to build.

Cat. KJ-7028 **$59.95**

60 in 1 Electronic Project Lab

This is an excellent way to learn about electronics. This kit uses springs to hold the components, and includes components such as resistors, capacitors, transistors, LEDs, Diode, transformer. relay. buzzer, switch, etc. Comes with user manual with 60 projects to build.

Cat. KJ-7026 **$39.95**

30 IN 1 ELECTRONIC PROJECT LAB

Limited quantity

See Cat page 27.

Cat. KJ-7020 **$33.47**

500,000 Candle Power Rechargeable Spotlight

NEW

This hand held mega bright spotlight operates from a 6V 4AH rechargeable sealed lead acid battery which is included. Its supplied with a 240V plugpack recharger and a lead to charge it from a car cigarette lighter. The battery is easily removed, so 2 or more could be kept charged for longer use. Cat. ST-3030

DEAL The Torch plus an Extra Battery for Only $52.90 SAVE $12.95

Torch $45.90

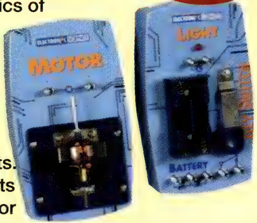
EXPERIMENTER'S KITS

These kits are designed to help you understand the fundamentals of DC circuits, motors, generators & bells. They are supplied unassembled & use quality components to build the finished circuits. Spring clips make connections easy & each project is built on its own mounting chassis. Manual & experimental ideas included. Great fun for ages 10 up.

Each kit has a bonus Light Experimenters Kit supplied (as pictured).

2 Kits in 1 - Motor/Light Experimenter's Kit

NEW



Learn the basics of electric circuits and the fundamentals of electric motors and lighting circuits. All components are supplied for assembly onto a neat panel using spring clips. Even the eletric motor itself is supplied in knock down form and requires assembly.

Cat. KJ-7042 **$24.95**

2 Kits in 1 - Bell/Light Experimenter's Kit

NEW

Build an electromechanical bell from scratch and learn the fundamentals of its operation. Combine the bell and light kit together & develop knowledge of the use of light and sound for all sorts of circuits from intruder alarms to battery indicators and continuity testers.

Cat. KJ-7040 **$24.95**

2 Kits in 1 - Generator/Light Experimenter's Kit

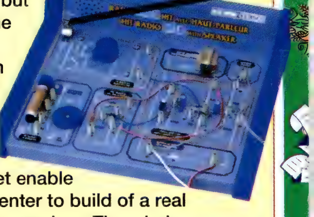
NEW

Build a simple dynamo to power the lighting kit (included) or the other kits in the range. Includes simple gearbox and mounts into its own plastic chassis. The lighting kit demonstrates the basics of simple electric circuits and power generation.

Cat. KJ-7044 **$24.95**

AM/FM Radio Kit

NEW



This is a more complex kit but maintains the spring clip construction method to keep the assembly as simple as possible yet enable the experimenter to build of a real AM/FM radio receiver. The whole assembly is built on its own chassis that measures 220(W) x 180(D) x 70(H)mm.

Cat. KJ-7048 **$39.95**

Internet Timer

Track the time you spend on the Internet and minimise your ISP bills. Mounts on top of your monitor and has two timers to keep track of total elapsed time and the current session time. •Max time up to 100hrs Cat XC-0120

Was $29.95 Dec $15.95 SAVE $14

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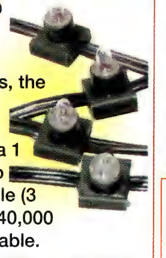
3 GLOBES PER METRE

PRE-WIRED



Pre-wired with a globe every 300mm, cable is green in colour and is ideal to hang through trees, the garden, under the pergola, indoors or over the Xmas tree etc. Each globe draws 40mA so a 1 amp transformer will allow you to use 25 globes or 8 metres of cable (3 per metre). Bulb life is 25,000 to 40,000 hours and bulb spacing is adjustable.

Cat. SL-2810 **$1.95 Mt**

REFLECTOR CAPS

Cat. SL-2816

Was $6.20

Dec.$5

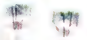
SAVE $1.20

COLOURED CAPS

Cat. SL-2812 PKT 25

$7.25

SPARE GLOBES



Cat. SL-2814 PKT 10 **Dec.**

Was $6.50 $5.50

SAVE $1.00

XMAS TREE LED KIT

Ref: SC Nov 99. A spectacular light show in the shape of a tree that will look great mounted on top of your Christmas tree, front door etc. 32 bi-colour LEDs (red & green) light in multiple patterns, controlled by the on board microprocessor. Kit includes tree shaped PCB, programmed micro and EEprom and all electronic components. 12VDC required - use MP3006 plugpack.

Cat. KC-5280 **$49.95**

Removable IDE Hard Disk Drawer

NEW

With power switch

Cat. XC-4671

$39.95

Both with 3 fans

IDE Mobile Hard Disk Drawer

Cat. XC-4670 **$28.75**

LED SANTA DISPLAY

NEW

Ref: SC Nov 2000

Imagine Rudolph and Santa flying across your house this Christmas. Make it a reality using this fantastic display. Uses over 600 high brightness coloured LEDs to create a briliiant animation. Kit is supplied with PCB, all electronic components, LEDs, wire, plenty of solder and transformer. Only a little hardware, paint and paitience will be required.

Cat. KC-5302 **ONLY $169**

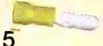
NEW QUICK CONNECTORS

NEW

A new range of quality crimp connectors with yellow crimp covers, and accepts larger diameter cable than the red & blue ones do. Cable entry size for the yellow is up to 10 gauge and feature 'wire easy entry'. Compare our low prices to others!! All in packs of 8.

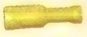
BULLET MALE

Cat. PT-4700 $2.75



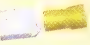
BULLET FEMALE

Cat. PT-4702 $2.75



FEMALE SPADE

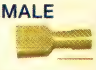
Cat. PT-4707 $2.25



FULLY INSULATED FEMALE SPADE

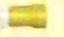
Cat. PT-4725 $2.75

Pkt. 50 Cat. PT-4726 $7.95



MALE SPADE

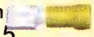
Cat. PT-4709 $2.25



MINI FEMALE SPADE

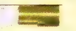
Spade width 4.8mm

Cat. PT-4722 $2.25



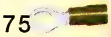
FORK LUGS

Cat. PT-4723 $2.75



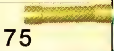
EYE TERMINALS

Cat. PT-4714 $2.75



WIRE JOINERS

Cat. PT-4727 $2.75



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Save a fortune this month with our Professional grade die cast aluminium lights. See cat page 258 for full details. Globes extra on all - most use bright halogen globes.

Pathway Illuminator

Cat. SL-2780

Requires MR16 globe

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20W 12V 38°	SL-2730	$5.61
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BC globes. Suits SL2782.

15W 12V	Cat. SL-2721	$0.97
20W 24V	Cat. SL-2719	$0.97

JC halogen pin globes. Suits SL2778.

20W 12V	Cat. SL-2722	$3.01
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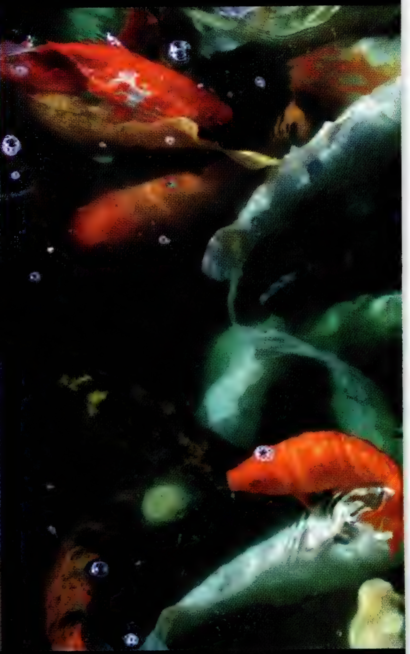
Latest-generation digital camera:

Kodak's DC4800

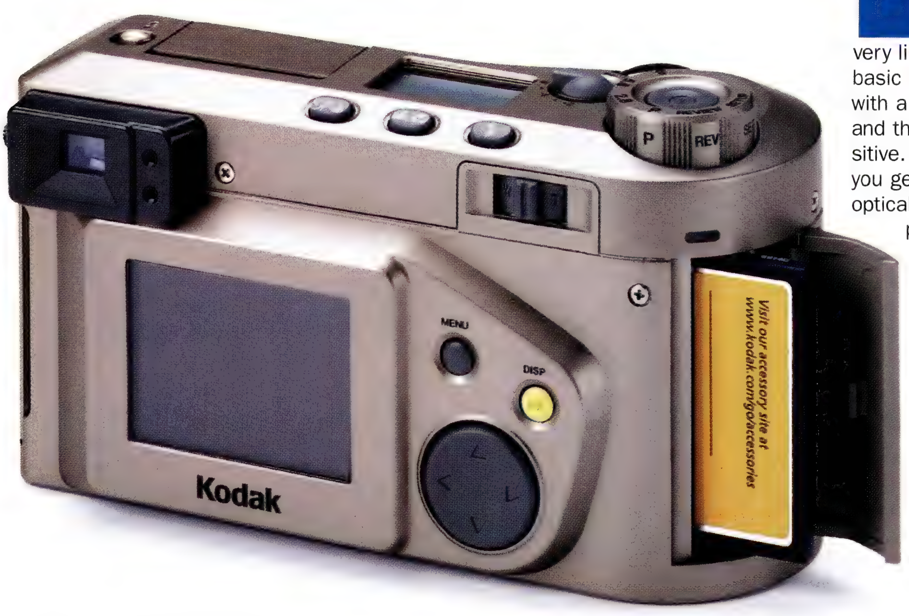
The new Kodak DC4800 digital camera offers very impressive performance, including high resolution 3.1-megapixel imaging, auto exposure control with manual over-rides, 3x zoom lens, 16MB removable PC card memory with a capacity of 15 high-res images and fast transfer to a PC via either an inbuilt USB port or direct swapping the memory card. It's also in a compact titanium alloy body, with many 'pro' refinements. **By Jim Rowe**



IF YOU'VE BEEN WAITING UNTIL DIGITAL CAMERAS REACHED THIS KIND OF LEVEL,

THIS ONE MAY WELL PROMPT YOU INTO MAKING THE MOVE FROM FILM TECHNOLOGY.

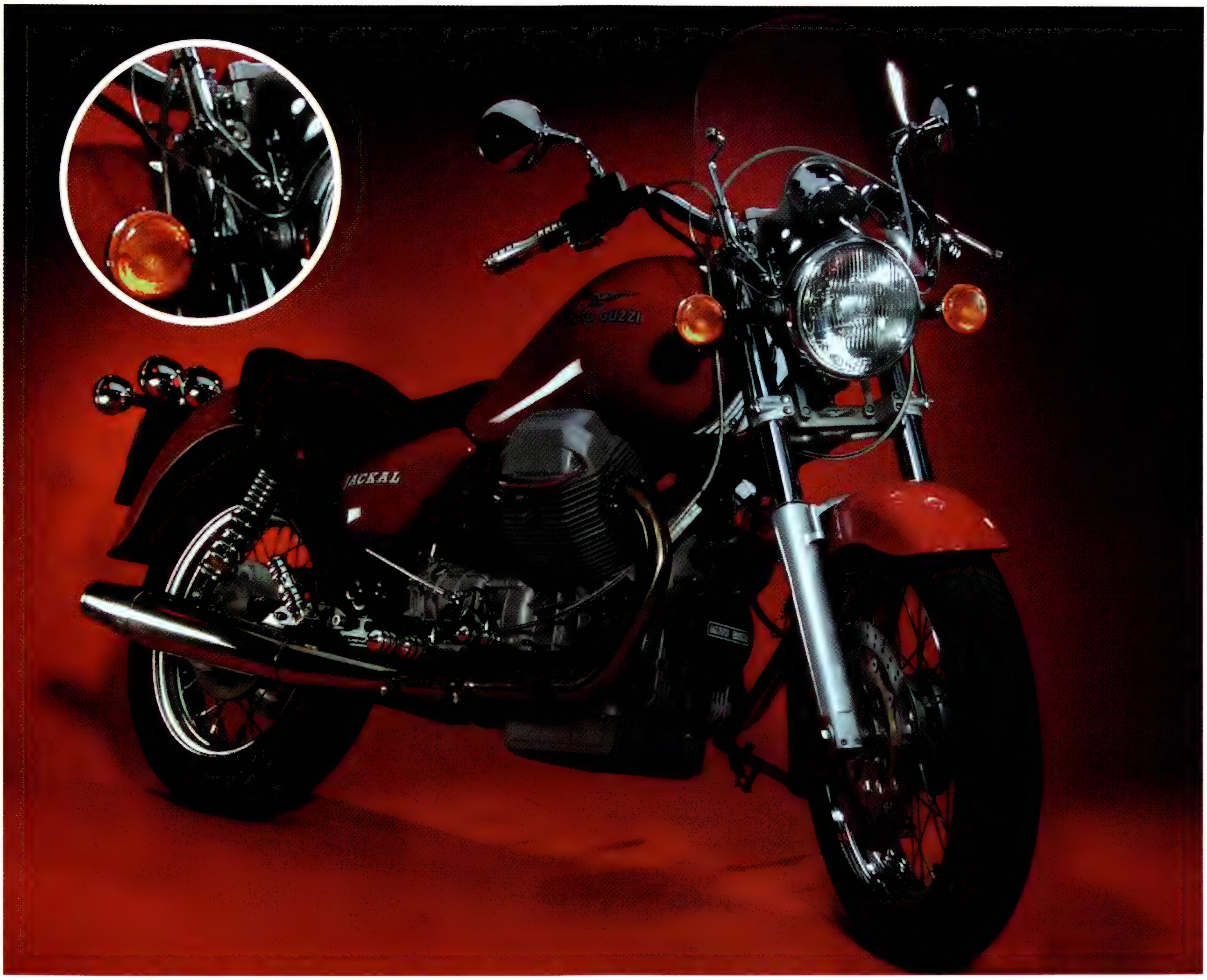
This picture *of a Moto Guzzi Jackal was shot in FPC's photographic studio using a Mamiya RB large-format professional film camera. The film was then scanned by a professional-grade Scitex flatbed scanner, and included directly into this document...*



LET'S FACE IT, the first consumer-level digital cameras of two or three years ago were pretty crude. Not just in terms of very limited image resolution, but also in terms of basic photographic functionality. Most were fitted with a simple fixed focal length lens, for example, and the CCD sensor was often frustratingly insensitive. Not only that, but for composing your shot you generally had a choice between either a poky optical finder with serious parallax error, or an LCD panel with poor resolution — and a battery drain that would flatten the camera's battery in surprisingly short order!

Kodak's new DC4800 is an excellent example of just how far the manufacturers have come since those pioneering days. It not only offers just about the same basic image resolution as a high-end 35mm film camera, but pretty well the same functions and operating flexibility as well. Consumer-level digital photography has at last come of age...

The DC4800 comes in a slim and



This picture, *on the other hand, was taken by the Kodak 4800 during the same photo session. Along with the small differences in the colour balance and constrast, there's not much between the two shots when reproduced at this size - the expanded section shows the difference close up.*

rugged body made from lightweight titanium alloy, cleanly styled to be very similar in size, appearance and 'balance' to a 35mm film camera. There's a small flip-up flash, attachments at each end for a neck strap (supplied) and even a mode control knob with knurled ring on the top, in about the same position as a typical film wind-on knob.

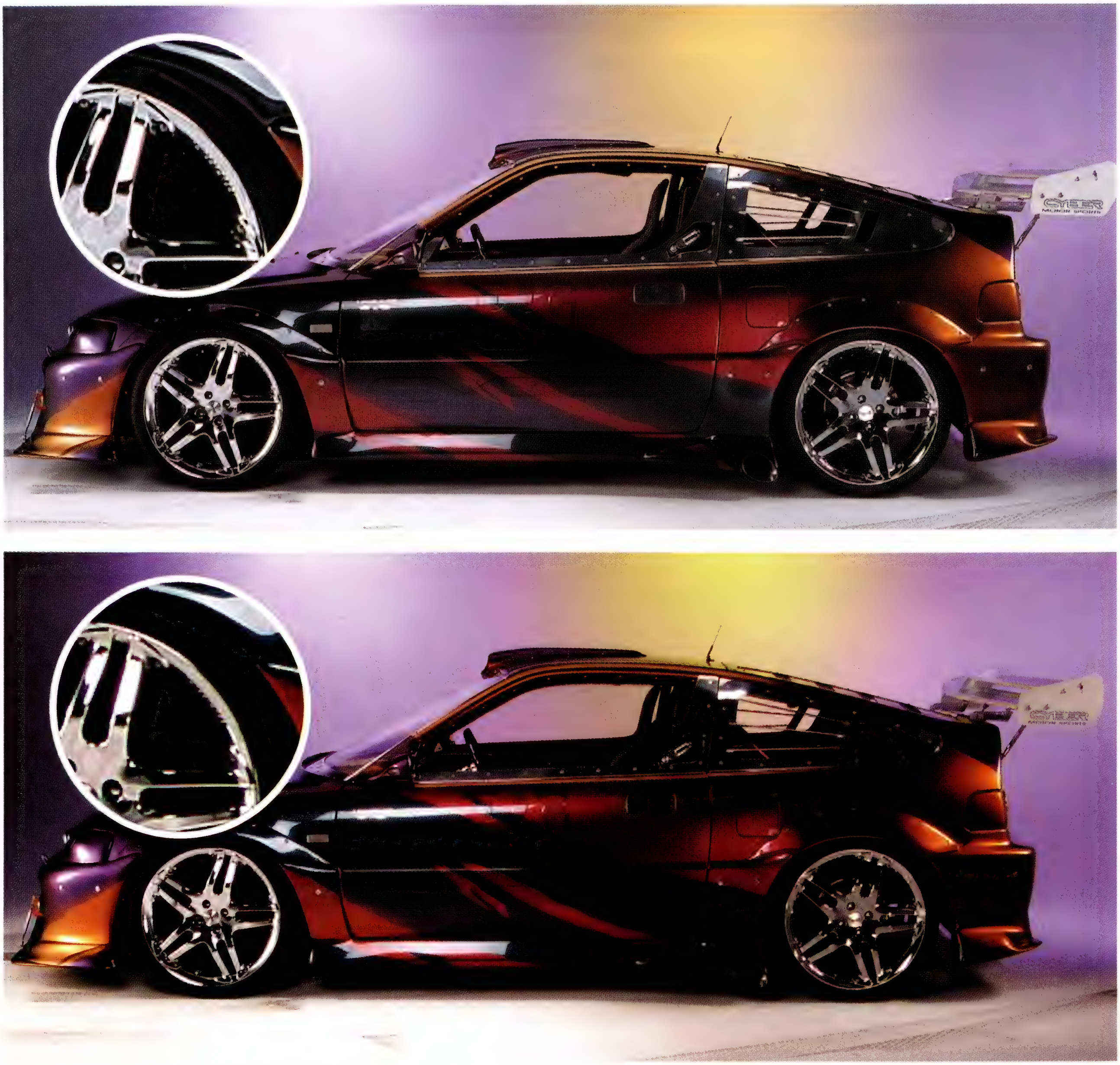
Of course the most salient selling feature of the DC4800 is undoubtedly its image resolution. In highest-res mode it takes images of 2160 x 1440 resolution or 3.1 megapixels, which is very comparable with the kind of resolution available from a standard 35mm still image frame. In this mode you can store up to 15 images into the removable 16MB memory card supplied with the camera.

The camera offers the option of saving these 3.1MP images at three different levels of compression, to allow trading image quality for memory space. There are also three lower-res modes for when you don't need top resolution, but do want to cram even more images into memory: 1800 x 1200 (2.1 megapixels), 1536 x 1024 (1.5 megapixels) and 1080 x 720 (780 kilopixels). As you can see even the lowest-res mode is still better than most of the first and second generation digital cameras, and it allows you to store up to 47 images in memory.

Along with its 3.1-megapixel CCD, the other prime feature of the DC4800 is a good Ektanar true optical zoom lens, with a 3:1 range (6 - 18mm) — the equivalent of 28 - 84mm in a 35mm film camera. This can be augmented with a digital zoom function giving a further 2:1 extension (i.e., to 168mm equivalent) if you don't mind throwing away image resolution. The maximum aperture ranges from f/2.8 at the wide end of the zoom to f/4.5 at the tele end.

The zoom is powered, and controlled by a Tele/Wide toggle at the rear of the camera. However it does provide two speeds for easier control. The lens is also autofocussing, but provides a macro range (0.2 - 0.7m) as well as a 'normal' range (0.5m - infinity).

The exposure is also automatic, but with manual over-ride giving a range of +/-2EV in 0.5EV increments. There's also automatic white balance, but with both preset and customisable fixed settings as options. You also get a choice of three B&W shooting modes as an alternative to colour shooting (with yel-



Here again, *the picture at the top came from the professional film-based gear, while the lower one was taken by the 4800 at the same photo shoot. When comparing the two, keep in mind that the equipment used to produce the results at the top will cost you over $10,000, and then you have to wait (and pay for) for the film to be developed and scanned - instant gratification and lightning fast turn around times are the hidden advantages of digital cameras. Our thanks to Michael Pugh for letting us invade his photographic sessions.*

low and red filters for contrast control), and a 'sepia' shooting mode. The effective sensor sensitivity can also be varied between 100, 200 and 400 ISO.

Although the shutter speed is normally controlled automatically by the auto exposure system, it can be set manually if you want to achieve special effects. The available range is from 1/2 to 1/1000 second, and yes — it's a true mechanical shutter. You can also take shots in aperture-priority mode, setting the aperture to f/2.8, f/5.6 or f/8 as desired to exercise more control over depth of field.

The flip-up strobe flash is quite small, but has an effective range of 0.5 - 3.2m. It has a choice of auto, fill and 'red eye' modes. There's also a standard sync socket on the side of the camera, if you need to use a more powerful external flash.

As well as a direct optical viewfinder with traditional dioptre adjustment, there's also a 45mm full colour LCD display on the rear of the camera with quite high (but unspecified) resolution, for composing and reviewing the actual images taken. This LCD is also used to display the menu system used to select many of the camera's modes and settings. A smaller B&W LCD on the top of the camera is used to indicate lens mode, remaining memory capacity, battery condition etc.

Quite apart from the direct and LCD viewfinders there's actually another viewing option which could be used for easy composition in a studio situation. The camera also provides a direct video output in either PAL or NTSC format, which can be fed directly to a standard

How a Professional found the DC4800

With a high performance digital camera like the Kodak DC4800, we thought it would be a good idea to ask a professional photographer to try it for a while and give their reactions. So the review camera was loaned to FPC photographer Michael Pugh, who used it on a number of his shoots. Here are some of the comments Michael made when he brought it back (reluctantly):

This camera is far more compact than I normally get away with using conventional film-based cameras. Most of my work involves lugging around heavy bags loaded with all manner of equipment. That was the first joy for me — something incredibly light to carry around. The instant editing ability using the LCD was also a delight. No more Polaroiding or shooting heaps of film to cover all bases.

Auto everything is great, so you don't have to know too much about what you're doing. When the auto exposure can't quite cope (such as in snow) there is an exposure compensation lever on top of the camera, so a check on the LCD review will help you here — there's a fiddle and a bit of thinking time involved. You can control aperture using the mode dial and also the shutter speed, but that requires another fiddle via the menus.

The mode dial does allow aperture-priority auto, but limited to three whole f-numbers: f/2.8, f/5.6 and f/8. I was concerned at first that I couldn't get enough depth of field for some of my pictures, but the focal length zooms from 6mm to 18mm, so it's probably not really an issue. These short focal lengths do stop you shooting shallow depth of field.

One of the difficulties with professional digital cameras is that they are usually hybrid systems. They use an existing suite of lenses which mount onto the camera, fitted with a chip smaller than the intended film gate (such as for 35mm film). Consequently all your digital pictures appear cropped compared to the equivalent on a film version of the camera. In other words, you need shorter focal lengths to match the same angles of view.

At least the 6mm end of the DC4800's zoom has an equivalent angle of view of about 28mm on a 35mm film system so this is a very useful feature.

The DC4800 has a lot of automation, but you can override it if you want to. I found the auto white balance pretty reliable, so I probably wouldn't muck about with that too much. And it's fun to be able to shoot black and white simply by altering one of the menu settings. You can even digitally simulate red or yellow filters for contrast control.

Wow, an external flash socket! This is every professional photographer's dream, and it really increases the applications for this camera. There is a pop-up flash if you really need it.

Of course, a few things bugged me. On a couple of occasions I found myself pressing the power button instead of the shutter button. OK, it may just be me, but then I don't know anyone else with eyes in their fingers either. Still, a few unexpected shutdowns later I found that I almost became used to it...

The digital zoom was very disappointing once I saw the loss of resolution on my downloaded files. It will probably be acceptable to DC4800 uses who are only ever going to take their discs in for printing at a processing outlet (much like taking in films for developing and printing), but I would imagine that most users with sufficient budget to purchase this camera would also have their own computer for downloading and manipulating their own pictures. I switched off the digital zoom.

The User's Guide has a good coverage of the major points of using the camera, but it does gloss over a few fundamentals — such as why is there a choice of three compression settings available with the 3.1 megapixels resolution? There is a lot of assumed knowledge about digital imaging which is a little confusing to first-time digital camera owners.

One more thing that really bugged me was the lens cap. Although it has a loop for a cord to help prevent losing it, how much neater a sliding cover would be, just like many Japanese compact cameras. Make it the power switch as well and it would overcome my problem of turning the camera off every time I think I am pressing the shutter button!

Yes, I do like it. The camera has its faults, but there are many pluses to compensate.

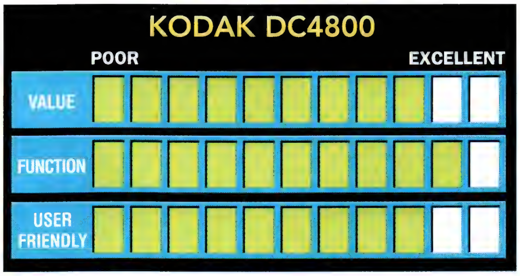
video monitor. As the video output mirrors the LCD panel display this also allows you to review all of the images in memory on a larger screen, in 'slide show' fashion directly from the camera.

To transfer images to a computer, the DC4800 has a built-in USB port and comes complete with USB cable and a CD-ROM with software for either Windows 98/2000 or Macintosh OS 8.6 or later. Alternatively you can remove the 16MB memory card from the camera and plug it directly into a compatible PC card slot (various card readers are available as optional accessories).

Power for the DC4800 comes from a single 3.7V/1100mAh lithium-ion rechargeable battery, which fits in a compartment at the 'fat' end. A matching AC adaptor supplied with the camera doubles as an in-camera battery charger.

A wide range of accessories is available, to make the DC4800 even more useful. For example there are memory cards with up to 128MB capacity, Ektanar closeup/tele/wide angle adaptor lenses, a Li-ion fast charger and of course different PC card readers.

In short, the Kodak DC4800 is not only capable of high performance but clearly designed with the serious digital photographer in mind. If you've been waiting until digital cameras reached this kind of level, this one may well prompt you into making the move from film technology. **ea**



SUMMARY

- A solidly made but compact and lightweight 3.1-megapixel digital camera.

KEY FEATURES

- Very high image quality: 2160 x 1440 pixels
- High quality 3x optical zoom lens
- Built-in USB port for fast image transfer
- Comes with removable 16MB memory card
- Built-in PAL/NTSC video output

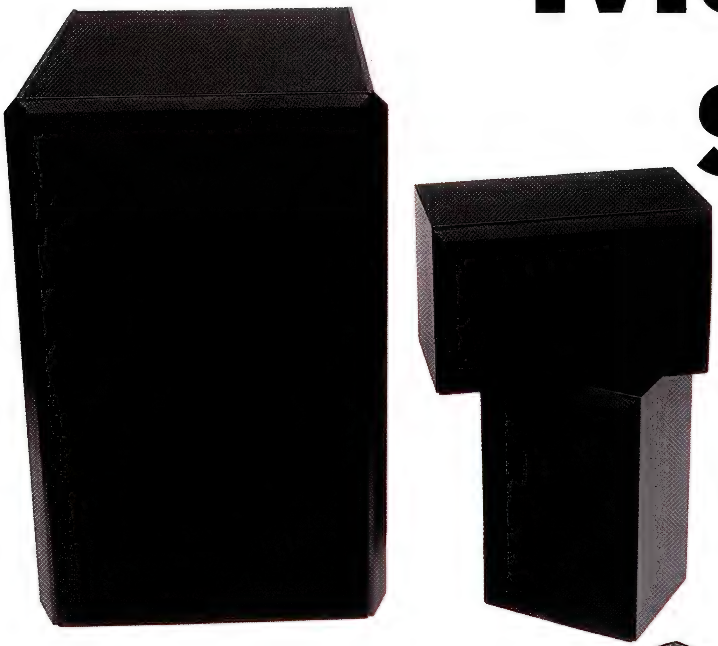
RRP

- $1999

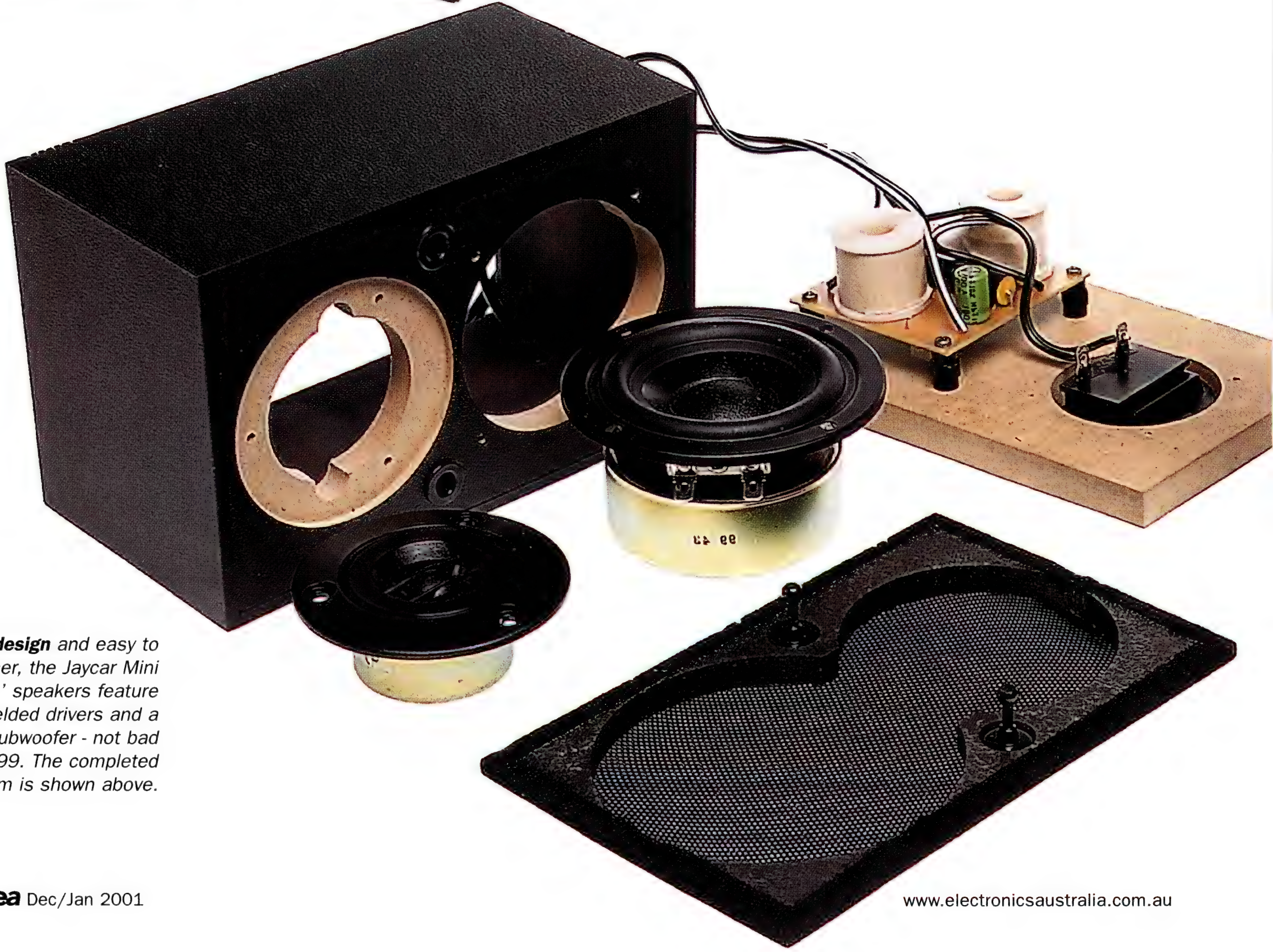
AVAILABLE

- Large electrical retailers and photographic specialists, or contact Kodak's Customer Support line on 1300 130 674.

Micro speakers
Maximum sound...



Tiny speakers don't necessarily mean a tiny sound, folks. If they're carefully designed and used with a well-matched subwoofer, the results can be spectacular. They have to be properly put together though, and in this case it's up to you... **by Rob Evans**



A neat design *and easy to put together, the Jaycar Mini 'lifestyle' speakers feature shielded drivers and a powered subwoofer - not bad for $499. The completed system is shown above.*

IF YOU HAVE A MINI or micro hifi system — you know, those compact systems where the speakers are the same height as the amplifier/CD/tuner unit — have a careful listen to the sound quality. Is the very low bass coming through? Does the midrange vocal area sound smooth without peaks and dips? Is high-end edge of cymbals or strings clear? And importantly, can you wind up the volume without the speakers distorting or rattling themselves to death?

How was the result? If your mini system scored a negative answer to one of those five checks, it could certainly be improved by upgrading the speaker system. If it failed in *more* than one of those areas, take it from us, you would notice a huge improvement in the sound quality by changing over to a better speaker system.

A very cost-effective way to do this has always been with a set of quality *kit* speakers, but up until now the market has been strangely bereft of a decent set of mini speakers in kit form. Perhaps it's the difficulty in designing such small speakers while still maintaining a decent sound, or maybe speaker kit manufactures just figured that mini system owners don't really care about sound quality. Whatever the reason though, Jaycar Electronics have now filled the gap with their mini 'Lifestyle' speaker kit, which offers a set of tiny two-way speakers (just 174mm high) *plus* a self-powered subwoofer.

A mini lifestyle

Based on past experience, we're happy to see that Jaycar has again commissioned local speaker design wizards Occasion Audio to develop this system. Occasion have managed to fit a 3-inch bass driver and 1-inch dome tweeter, plus a two-way crossover board in a tiny 0.6 litre satellite enclosure, and with considerable success it seems.

That might sound simple enough, but the baffle size and enclosure volume restrictions make it very difficult to both mount the drivers and tune the box low-end response. Occasion's designer, Phil Routley has worked around these problems by sourcing a bass driver with parameters that suit a very small cabinet, and has positioned the drivers in a unusual overlapping scheme — as well as reducing the enclosure height, this has the benefit of bringing the acoustic centres of the two drivers closer.

The system's subwoofer is a more conventional arrangement, with a 6-inch subwoofer driver mounted in an 18 litre bass reflex enclosure. It's a 4-ohm system powered by a 65W subwoofer amp fitted into the enclosure's rear panel, and this also provides the crossover for both speaker systems.

It's a slightly unusual setup, but the amp module has a first-order *passive* high-pass filter between two sets of (stereo) speaker terminal strips, and an active low-pass filter feeding the amp powering the subwoofer. The idea here is that the main stereo amp connects to the satellite speaker via these terminal sets (therefore through the internal HP filter), and the sub amp's active LP filter just takes its signal from the input terminal set - that's the one connected directly to the main amp.

That active filter has a user-adjustable turnover point by the way, and is set to it's maximum frequency (180Hz) with this system.

With all subwoofer-based setups though, the most overlooked (and probably the most tricky) part of getting a decent overall sound is the acoustic marriage between the two speaker systems. You can have the best possible subwoofer and main speakers individually, but the results will be appalling if the two don't work well together. The factors involved in making this a success are many and varied, but mainly include the roll-off and phase response of the two systems plus of course, the speaker positioning in the room.

As far as the roll-off and phase response aspects are concerned, the designers seem to have done their homework, since the satellites in particular exhibit a smooth roll-off with a moderate and progressive phase change. In practice this means that the overall system integrates well in the critical low to high

Get serious about computer sound

Pushed mainly by the exploding popularity of MP3 digital music files, the home PC is becoming a favorite basis for a home sound system amongst technically savvy users. With the PC's ability to play both MP3 and standard CD-based music through its soundcard and attached speakers, it's a viable option to shelling out wads of cash for a conventional hifi setup.

The problem of course is that standard or even so-called up-market PC speakers sound ordinary at best, and often just plain awful — plastic sound from plastic speakers, some might say. Assuming that your PC's fitted with a half-decent soundcard though, adding a reasonable amplifier and speaker system can produce quite spectacular results that are undeniably of a hifi standard.

What's really needed for a PC-based speaker system is fairly well defined by standard el-cheapo speakers, really. They must be small, magnetically shielded to avoid interfering with the PC's monitor, and preferably have a matching subwoofer. The other criteria in this case though, is that they must have a sound quality that's fitting for a hifi system.

Well designed mini speaker setups like Jaycar's Lifestyle system are ideal for this job, and when coupled with a decent amplifier offer a cost-effective path to a practical, high-quality setup. Also, since the amplifier only runs the satellite speakers (from roughly 200Hz up) it doesn't need a lot of power — we found a 20+20W amp comfortably kept up with the subwoofer's built-in 65W amp.

Let's not forget computer games either. While this setup works well as a home hifi system, the sound of a decent PC audio system is nothing short of amazing with most recently-released games. These use the capabilities of the soundcard and the attached sound system to the full, with CD-quality music, gut-rumbling subsonic signals, and complex 'environmental' phasing effects. PC game-wise, you haven't lived (or been 'fragged' as the case may be) until you've tried one of the recent titles with a capable sound system.

MOFFAT'S **MADHOUSE**

BY TOM MOFFAT

Mending Moffat's mucky

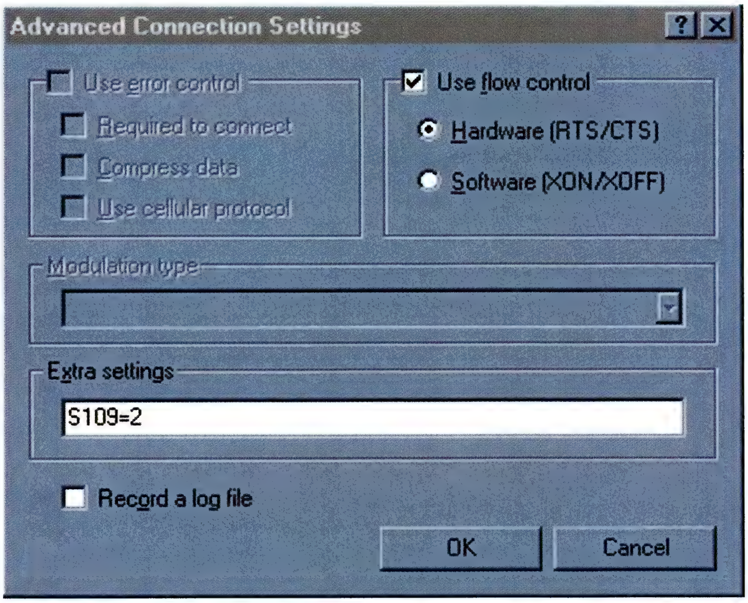
AN UPGRADE OR FIRMWARE FLASH WOULD WORK ITS MAGIC SPELL ON EVERY PESKY

HAVE YOU EVER thought that the modem in your computer now, will be the last one you ever own? That's probably true, because modems — the kind that hook up to telephone lines — are just about out the door, to be replaced by high-speed goodies like cable internet and DSL. In the meantime, this column will describe a fix that may make your crappy old telephone modem live out its final years performing like a champion.

All I can say is, it's about time, because my latest and last modem has been an enormous pain in the whoozits since the thing turned up on my doorstep maybe three years ago. This wonderful technological marvel was made by the Hayes company, the company that first introduced modems into the consumer market. Their method of operation — 'Hayes standard' — became the communications standard for all other modems. To actually own a Hayes modem was considered a luxury. Then the company went broke.

This was my second Hayes modem, bought after a couple of years satisfaction with a Hayes 33.6k modem. That one installed easily in my laptop computer, worked fine on the first pop, and it never failed me. So when it came to upgrade to 56k, Hayes was the natural choice.

At the time there were two 56k standards: X2, pushed by US Robotics, and k56flex promoted by Rockwell. There were furious arguments about which was better, although both did pretty much the same thing. Usually the choice was dictated by your internet service provider. They had X2 modems on their end, or k5kflex, but seldom both. So if your ISP was running k56flex, you had no choice but to run k56flex as well. Here in Port Townsend we had one ISP running k56, and one running X2. If you wanted to change ISPs you had to buy a new modem.



Advanced Connection Settings

☐ Use error control
☐ Required to connect
☐ Compress data
☐ Use cellular protocol

☑ Use flow control
● Hardware (RTS/CTS)
○ Software (XON/XOFF)

Modulation type

Extra settings: S109=2

☐ Record a log file

So my Hayes k56flex modem came into my life and it did its stuff, not brilliantly but well enough. On a good day it could achieve a connection speed of perhaps 40k bits per second, a noticeable improvement over 33.6k. Sometimes it had difficulty connecting, sometimes it hung up the line on its own. But it was the latest and greatest, so I had to like it.

As the two 56k modem standards bumbled along, the world waited patiently for the fabled V.90 standard to emerge. This would fix everything, or so the story went. There were release dates predicted, and release dates missed. Everyone wanted to upgrade, because the two earlier standards had been arranged so that a simple software

modem

swap, a 'firmware flash', would work its magic spell on every pesky modem in the land. For free.

Risky business

Flashing one's firmware is always a little risky, because it's often difficult if not impossible to restore things if the flash fails for some reason. The X2 side had an advantage here — the modems' flash memory was big enough so the new V.90 software could be installed alongside the older X2 code without affecting it, and you could then choose to use either X2 or V.90. Not so for k56flex; these modems had smaller memory so the new V.90 overwrote the earlier code. So once you had V.90 installed, k56flex was gone forever.

MODEM IN THE LAND. FOR FREE.

V.90-day finally arrived, and the Hayes web site offered the new code, along with a program to load it into your modem, free for the taking. So I downloaded the new software and ran it without incident. In a few short minutes, I had myself a nice new V.90 modem. Sort of.

The upgrade was a step backwards. Communication speeds were lousy, the modem hung up the line frequently, and sometimes it froze up completely. The Hayes company no longer existed, so there was no longer anyone to complain to. A few times I gently complained to the ISP, suggesting their modems might be the culprit, not my modem. But no, they said other customers were doing just fine with their modems. I was able to confirm this by watching someone else's US Robotics V.90 modem connecting at 53k and downloading content in a constant, speedy stream.

I put up with that V.90-flashed Hayes modem for a long time, maybe a couple of years, hoping I could find a way to make it work at least a little like its US Robotics cousin. I downloaded a document containing the entire Hayes modem command set, all those obscure AT commands and S-register settings, and found out how to restrict the connection speeds the modem would attempt, in case it was simply overwhelmed by incoming data. That didn't accomplish anything; it was really clutching at straws since the modem's handshaking signals would take care of potential data overflow.

Back to 33k

Eventually I gave up on 56k altogether, and reset my dial-up system to dial into the ISP's 33.6k number. Here the modem worked fine, just as good as my earlier 33k modem I'd paid $250 to replace. What an absolute bummer. I was stuck with an expensive product which simply wouldn't work, and no recourse to the manufacturer since the company no longer existed.

Finally, at long last, success: On some obscure newsgroup, I found a posting describing how a change to one of the modem's S-registers had trans-

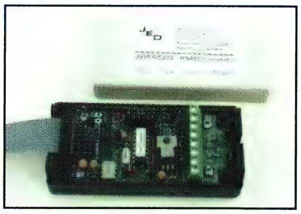
THE TIGER COMES TO AUSTRALIA

You've seen the BASIC Tiger and Tiny Tiger advertised in the US magazines: they are now available in Australia from JED

Tigers are modules running true compiled (not tokenised), Multitasking BASIC at 20 Mhz, but only draw 45mA. They have memory, 4 x 10-bit analog inputs, digital I/O, two serial ports, RTC, and are superb small controllers for scientific and industrial applications. **A Tiger with 128kB FLASH, 128kB CMOS RAM and RT clock costs only $247.50.** A development system (W95/98/NT), with a proto board, is only $330. JED has a local board/controller with LCD/Kbd and industrial I/O.

See our www site or call for data sheets.

RS232 to RS485 Converter



The small plastic case 100mm by 55mm by 25mm is an Australian-built RS232 to RS485 optoisolated converter. It connects a PC or PLC RS232 serial port to a multidrop RS485 differential cable up to 4,000 ft long.
The J995X converter has an internal microprocessor to automatically connect the transmitter to line, so the user program need not use the RTS line for RS485 TX control.
Cost $176 plus $22 plug pack.

$330 PC-PROM Programmer
Also: Chiprase Eraser $258.50
This programmer plugs into a PC printer port and reads, writes and edits any 28 - pin or 32 pin PROM without needing special plug-in cards.

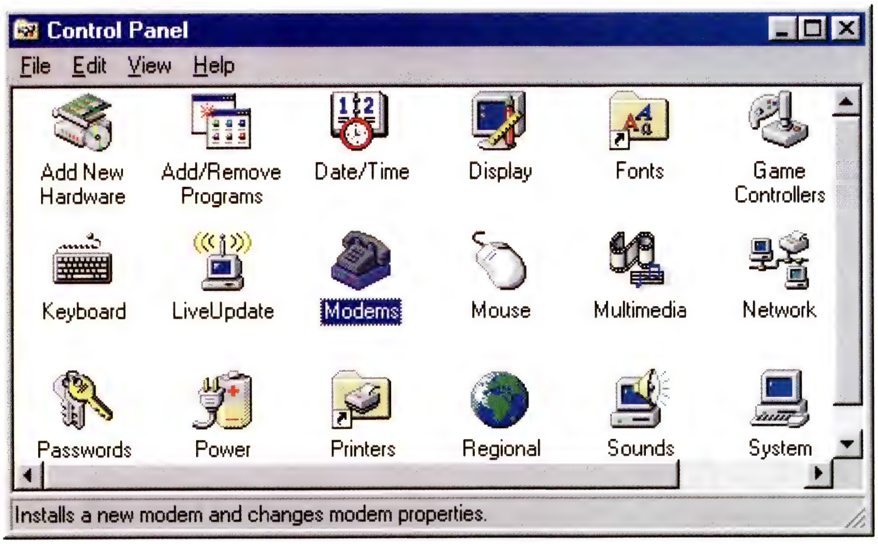
JED Microprocessors Pty Ltd
www.jedmicro.com.au
173 Boronia Road, Boronia, 3155
Ph 03 9762 3588
Fax 03 9762 5499
(prices include gst & subject to change with exchange rate)

formed a Hayes Accura modem from a dud to a dream. My modem was an Optima, not an Accura, but it was still worth a try. And, to cut a long story short, it worked!

Remember I said that once a Hayes modem was flashed with new V.90 firmware, the older k56flex firmware was overwritten and destroyed. Yet one of the modem's S-registers, number 109, was there for one purpose: To switch back and forth between k56flex and V.90 operation. The register had three possible values: (0) forced a k56flex connection, (2) forced a V.90 connection, and (1) let the modems at each end negotiate either standard as they saw fit. The default setting was (1), giving the modems total control over the standard to be used.

It turned out that for every connection, the modems were choosing k56flex for reasons known only to themselves. My V.90 modem had never actually connected at V.90, only k5kflex. BUT, the k56flex firmware had been clobbered by the V.90 upgrade, so what was left was some communications protocol that must have been either a ruptured K56flex or a combination of k56 and V.90. In any case, it didn't work worth a damn, and I'd suffered it for two years.

The solution was to add a command to the modems's initialization string: S109=2. This forces the modem to connect as V.90 every time, without giving the ISP's modem any say in the matter. That's it! All done! Even though I live at least 5km from the telephone exchange, the modem began connecting initially at 45333 and then producing measured data throughputs of over 40k. The screeching noises even sounded different. A whole new kettle of fish! This is modernisation as it should be. No cutoffs, no freeze-ups. No swearing, no crying. It works, just like it's supposed to. How unusual...



Installs a new modem and changes modem properties.

What I want to know is this: Why was this modem equipped with the ability to switch to the k56flex communications protocol, despite the fact that the software to run that protocol no longer existed in the modem? My suspicion is that the modem code was designed with a view toward original equipment, not an upgrade of older equipment which zapped part of the original code.

DIY upgrade

Anyhow, there are a lot of Hayes-type modems out there, and there's a chance you might be a happy owner of one, just like me. I believe the code is actually written by Rockwell, and Rockwell firmware is used in many modems in addition to the Hayes-branded models. It's only going to cost you a few minutes to find out if you can turn a mediocre modem into a stunning performer. And it's impossible to damage anything.

First, under Windows, fire up HyperTerminal or some other program that will let you communicate directly with your modem. You can test this by typing 'AT <ENTER>' and if the modem responds with 'OK', you and the modem are on speaking terms. Now type 'AT S109?'. If the modem responds with 'ERROR' you're out of luck, it isn't the right kind of modem. But if you get '1' back, you're in business. Try 'AT S109=2' and the modem should respond with 'OK'.

To make this fix permanent, go into Windows control panel and select 'Modems' where your modem type should be displayed. Select Properties, then Connection, then Advanced, and then in the area labelled 'Extra Settings' enter 'S109=2' along with whatever else is there. You don't need to begin with 'AT', that is already sent to the modem by the time Windows transmits these extra commands. (These instructions are for Windows 95, Win98 should be similar.)

There's something terribly ironic in all this. I fought that modem, and fought it, and fought it some more. You've probably done the same with yours. Now we find the fix, right on the verge of the next wave of new technology — the arrival of high-speed modemless internet connections. I don't know how things are over there in Oz, but where I live a high-speed line costs at least three times as much as a traditional phone-line connection. You get high speed between you and your ISP, but what they don't tell you is you still have to suffer the same old traffic jams on the internet itself. So I think I'll be sticking with Mr. Hayes for some time to come yet. At least I *know* he's going to work! **ea**

To understand why $6,843 is a fair price to pay for VAF kit speakers, read 580 words from a violinist who can't use a screwdriver.

The following is an excerpt from a review which appeared in Audio Video Lifestyle Consumer Guide '99 by Sian O'Neale.

"Phillip Vafiadis is the creative talent behind the brand and his aim with VAF Research is to market kit loudspeakers of uncompromising quality at the serious end of the hi-fi market.

The VAF range is priced from $312 a pair right up to $8,863 a pair*, so we're talking serious money here for serious equipment.

We at AVL magazine have been particularly impressed with DC-X series.

These kit loudspeakers are not the standard packages from consumer electronics stores. In fact, you won't find these products in any store. The company prefers to cut out the middle-men and save buyers money, so every product is available factory-direct.

The VAF Signature series includes the Signature 1-66 and 1091 loudspeakers. Taking delivery of the 120kg 1-66 floorstanding speakers is something of an experience; I have never seen such an imposing crate for a pair of loudspeakers before. Fortunately my brother Crispin is capable with the screwdriver and we took out the massive 1-66s. You will need quite a bit of muscle and help to unpack these speakers and get them where you want them. The engineering and attention to finish that has gone into these fully assembled VAF Research 1-66s is simply awesome.

These elegant but powerful looking loudspeakers come with removable velcro attached grilles in a 3-way design; a 210mm hard paper bass driver with solid copper phase plugs and a 25mm double chamber sonotex dome tweeter with a pure silver wire voice coil. Turn the speakers around and you have very high quality gold plated binding posts which allow for bi-wiring and tri-wiring.

The same meticulous attention to detail and build quality also goes into the smaller 1-91 models, three of which are presented as left and right rear surrounds and a centre channel speaker for home theatre use (which has a custom-designed grille for a centre channel speaker). But the 1-91 loudspeakers have been designed to also perform as high quality studio monitors with the same superb sound as the 1-66s.

The speakers were designed to be used close to a rear wall and that's how customers use them, ideally 15cm-40cm from the nearest wall. But I think the speakers sound better when they can breathe more easily. Find the right position for the room and you will be richly rewarded.

The big VAFs deliver a stunning soundstage which is wonderfully insightful and involving. Large scale orchestral works have a level of depth and accuracy that only the best loudspeakers can manage.

As a violinist, I am often left unimpressed with the sound of the violin through so many loudspeakers (even high-end models), but here the presentation is accurate and engrossing. Instrument separation between different members of the orchestra is faultless.

This is particularly obvious when listening to Hans Zimmer's evocative soundtrack for The Thin Red Line in which quiet, gentle music provides so much power and atmosphere.

As a system for home theatre, together with the smaller satellite 1-91s, VAF has assembled an incredible system. Bass extension from the 1-66s is awesome; deep and thrilling, which is ideal for action blockbusters such as Speed, Twister or Titanic (you don't just watch the ship sink - you feel it through the floorboards). The centre channel speaker locks dialogue firmly into place and steers the sound with maximum impact; dialogue in Speed comes across as frantic as the driving. Full marks."

---

* Figures amended to reflect current pricing.

For the entire transcript of this review or information on our 14 models contact VAF Research and ask for your copy of "What the Critics Say". Free call 1800 818 882. Email vaf@vaf.com.au or surf www.vaf.com.au

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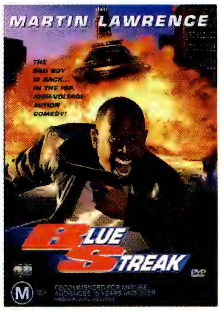
kwp11332

A Jewel thief, a wanna-be director and a thrilling Hitchcock classic


MARTIN LAWRENCE
THE BAD BOY IS BACK... IN THE HIP, HIGH-VOLTAGE ACTION COMEDY!
BLUE STREAK
M

Picture:	■■■■■
Sound:	■■■■
Movie:	■■■■
Bonus Extras:	■■■■■

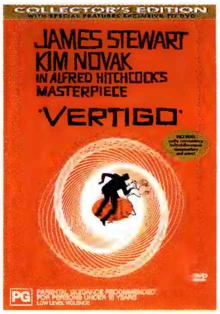
BLUE STREAK

Columbia, 1999. Directed by Les Mayfield, with Martin Lawrence, Luke Wilson, Dave Chappelle and William Forsythe. Widescreen (16:9 enhanced); colour, 91 min. SS/DL disc, Dolby Digital 5.1; Columbia TriStar Home Video.

■ Hip comedian Martin Lawrence (*Bad Boys, Life*) provides plenty of laughs and sight gags in this fast moving action comedy. Lawrence plays a jewel thief who just manages to hide a huge diamond he's stolen in a building under construction, before being arrested. After serving two years in prison he returns to retrieve it, only to find that the building is now a major LA police station. To gain access he impersonates a detective, but turns out to be more successful as a cop than in retrieving the rock — for a while at least. It's all good fun, although to my mind Lawrence does go a bit over the top at times.

The picture quality on this Sony Gold Standard DVD transfer is excellent, and the Dolby Digital 5.1 sound is also very good. There's quite a good collection of bonus extras, too: two behind-the-scenes featurettes (21 min and 22 min), the original trailers, talent profiles on Lawrence, Wilson and Mayfield and music videos by So Plush, Jay Z and Tyrese.

One way and another, then, the DVD makes an excellent way to see this quite entertaining comedy/action adventure. (J.R.)



Picture:	■■■■
Sound:	■■■■
Movie:	■■■■■
Bonus Extras:	■■■■

VERTIGO

Universal, 1958. Directed by Alfred Hitchcock, with James Stewart, Kim Novak and Barbara Bel Geddes. Widescreen (16:9 enhanced); colour, 124 min. SS/DL disc, Dolby Digital 5.1; Columbia TriStar Home Video.

■ Although Hitchcock's thriller *Vertigo* was a bit too dark and psychological for audiences in the late 1950s, it has steadily grown in popularity over the years since and is now widely regarded as a cinema classic. So much so that with Universal's help it was thoroughly restored and re-released in 1996, as a 'better than new' 70mm print complete with 5.1-channel DTS sound track remixed from the original stereo master recordings.

Happily this Collector's Edition DVD transfer is from the restored version, and offers surprisingly good image quality combined with a very satisfying Dolby Digital 5.1 track. It also offers a nice collection of bonus extras including *Obsessed With Vertigo*, an informative 29-minute documentary about both the making of the original film and its more recent restoration. There's also a feature commentary by the restoration team and Hickcock's original associate producer, two original trailers, cast and film makers' notes and fairly comprehensive production notes.

All in all, it makes an excellent way to see and enjoy, let alone study, this acclaimed movie classic. Well worth a place in any cinema buff's collection. (J.R.)

Picture:	■■■■
Sound:	■■■
Movie:	■■■
Bonus Extras:	■■■■■

BOWFINGER

Universal, 1999. Directed by Frank Oz, with Steve Martin, Eddie Murphy, Heather Graham, Christine Baranski and Terence Stamp. Widescreen (16:9); colour, 93 min. SS/DL disc, Dolby Digital 5.1 surround; Columbia TriStar Home Video.

Written by Steve Martin himself, this is a good natured comedy that also takes a gentle swipe at the grottier side of Hollywood and the foibles of those in the movie industry. Martin plays a wanna-be director who desperately wants to make good, and hits on a way to make a movie with big star Kit Ramsey (Murphy) — without the latter actually being aware of his involvement. Ramsey's gormless brother Jiff (also played by Murphy) gets involved too, and Graham plays the starlet who'll do anything with anybody to further her career. It's all good escapist fun, directed with just a touch of 'edge' by former Muppeteer Frank Oz.

The image quality on this DVD transfer is quite good, albeit a trifle soft. The sound quality is quite clean too, although there's very little output from the surround or LFE channels.

There *is* quite a lot in terms of bonus extras, though: a 23-minute 'making of' featurette, a feature commentary by director Frank Oz, some deleted scenes and out-takes (quite funny), the original trailer, production notes and cast/film makers' notes, and DVD-ROM accessible stuff including a behind-the-scenes featurette and cast interviews. (J.R.)

FORUM

CONDUCTED BY JIM ROWE

Sped-up movies on PAL video, and DVD picture & sound quality

We're taking a break from the dreaded alternative electrotherapy devices this month, and revisiting the topic of movies being sped-up when they're transferred to PAL video formats like videotape and DVD. One of our earlier discussions of this has prompted a long response from a reader, who has also taken the opportunity to comment on related matters like the picture and sound quality delivered by DVDs.

YOU MAY RECALL that we first looked at the subject of movies being 'sped up' when transferred to PAL video formats a year ago, when I published a letter from Melbourne reader Kevin Attwood in the December 1999 column. Mr Attwood was irritated by the 4% increase in pitch resulting in the shift from 24fps (on the original film) to 25fps (as needed by PAL video), and after complaining to the videotape and DVD distributors but receiving no satisfaction, had decided to solve his personal problem by importing NTSC discs from the USA.

In the following February column I ran a couple more letters on the same topic, from ACT reader David Leaver and Melbourne reader Ken Simpson-Bull. Mr Leaver was basically bemused by the fuss, saying most people were incapable of noticing the speedup, while Mr Simpson-Bull supported Mr Attwood and agreed with him that the simplest solution was to import NTSC discs from the USA.

Then in the May column, I presented a follow-up letter from Mr Attwood, giving some further thoughts — plus evidence that some PAL video transfers made via NTSC do seem to have been converted to preserve correct pitch, showing that it *can* be done...

To the best of my memory that's as far as we've gone with this topic to date. But not long after Mr Attwood's second letter appeared another quite long and detailed missive arrived by email, this time from reader Keith Walters of Riverstone in NSW.

Mr Walters has a background in the TV and video industry it appears, and he not only addresses the movie speed-up question but quite a few related aspects as well. Because of this I wanted to present it in full, rather than only give extracts from it; the trouble is that until now, there's hasn't been the space to do this. So before the opportunity slips by again, let's do so. I think you'll find it as interesting as I did:

I have been somewhat bemused by all the hoo-ha surrounding the introduction of the DVD video format, regional coding etc. Most of the media coverage and reader correspondence seems fixated with the notion that this format is somehow going to 'revolutionise' the home video experience for the masses.

I'll allow that it might bring some worthwhile improvements to the average viewer's picture and sound quality, as well as being more convenient to operate. But when it's all said and done, I can't see things changing all that much.

True to the prediction I made in this column about seven years ago, digital TV techniques have certainly taken the video world by storm, to the point where superb-quality digital VCRs are now being incorporated into relatively inexpensive consumer camcorders. (Unfortunately, the attached cameras still remain shackled by the limitations of the CCD sensor — a descendant of the 'bucket brigade' delay line, itself a strange 1960s-era PMOS 'one off' technology that seems unlikely to get much better; but that's another story!)

Excellent picture

There's certainly no question that, given adequate source material, DVD players are very capable machines, yielding what in the past (and I daresay, the present) would have been regarded as a 'no-questions-asked' first rate, broadcast-quality picture. But whether this enthusiasm is going to trickle down to the man in the street, to the point of him wanting to fork out more money for a better TV set and so on, remains to be seen.

Nobody seems to consider that not everybody wants to (or will be allowed to!) turn their lounge room into a mini-cinema with a gigantic TV, speakers everywhere and so on. Actually I saw a perfect example of this a couple of months back: a friend's son had just blown his life's savings (about $4000) on a fancy multiple speaker surround sound system. Expletives deleted, (mainly to save space :-), his mother suggested that if he had any notions of installing that lot in her lounge room, he might want to consider thinking again! So now it all resides in his small bedroom, turning it into a snake pit of monster cables running everywhere, with a tiny 51cm TV somewhere in the middle!

Another acquaintance has just blown the best part of $10,000 setting up a home cinema system with a big-screen TV, DVD, Foxtel, a Yamaha surround sound system and so on. His kids (particularly the girls) won't use it. As one of them put it: "By the time you figure out which remote you're supposed to use, it's time to go to bed!"

So they still hire their own VHS movies and watch them on a clapped-out 51cm video combo unit that one of them found in a council cleanup and I got working for them...

To be sure, as the price of DVD players continues its downward spiral and consumers come to realise the nifty things you can do with videodiscs (that there's no rewinding, and that they don't wear out and clog your video heads like rental tapes are prone to doing), then they will become more popular. But until the manufacturers find a cheap and foolproof way to make the things RECORD as well, I don't see as much immediate future in the format as some people would like to have us think. (As a stopgap measure, what would be so terribly wrong with bringing out DVD players with a VHS deck built in as well?)

Regional coding

On the thorny subject of Regional Coding (enthusiasm of rabid videophiles aside), do you really think a viable DVD market (software and hardware) is going to be supported by people buying 'Vi-Fi' disks, whether locally or through the internet?

If there's going to be any real DVD market, it's got to be supported by rental libraries. DVDs (or prerecorded video tapes for that matter) are not like audio CDs — most people most of the time don't want to see the same movie more than once. So all this excitement about 'regional coding' is really pretty point-

less. What main street video library is likely to risk the legal consequences of stocking their shelves with illegally imported DVDs? And if the odd person does manage to bypass 'the system', so what — it's hardly going to break the distributors!

But what really baffles me is that after more than 20 years of evidence to the contrary (i.e., the popularity of VHS and Betamax VCRs, crappy under-$400 TV sets, etc), manufacturers still imagine the average punter is really going to be overwhelmed by the improved picture and sound quality alone.

You only have consider what happened with audio CDs. About 20 years ago, the CD was being first and foremost promoted as the 'next generation super-hifi' component. When they finally became available in the early 1980s, the original players were ludicrously expensive (especially considering many of them had only 14-bit ADCs!), and that was only the start of it. According to the popular press, if you had any notions of just hooking a CD player up to your existing stereo system, well, you could just forget that notion right there. There was no way 'yesterday's' amplifier and speaker technology could ever cope with the 'demands' of digital audio.

(Presumably to reinforce the point, Sony brought out that infamous classical 'sampler' CD, the one where the very first track — 'Explosions Polka' — starts with an extremely loud cannon shot. There was no warning or musical introduction, just dead silence and then BOOM!, presumably to be followed by a trip to the hifi dealer for a new amp and speakers. The one I was given I immediately cut in half with a pair of tinsnips, ears still ringing...)

Of course the biggest problem in the early days of CD (as is now still very much the case with DVDs) was the limited range of titles available (mostly classical and jazz releases).

And I can still hear the howls of outrage from the 'golden-eared' community when more mainstream titles did begin to appear, that were mostly just re-releases of (screech!) analog-recorded LP's!

Most can't tell

Well this trickle soon became a flood, as recording engineers realised that the vast majority of the population simply can't tell the difference between analog-sourced and digitally-sourced recordings. Soon virtually the only pure-digital ('DDD') recordings being released were of things like jazz combos and classical performances, which could usually be recorded digitally on U-matic videotape via a PCM encoder (and later, DAT) and released 'as is', with no requirement for post-production.

The plain and simple truth was that recording studios were simply not prepared to go to all the expense of re-equipping for all-digital ('DDD') recording when they were quite sure that virtually none of the buying public would either understand or care. Apart from this, with 24- or 48-track analog master tapes, you could go just about anywhere in the world and be reasonably confident that you'd be able to find a facility somewhere that could play them; this was simply not the case with digital recordings.

And look at what you get nowadays: just about any old crap that can be coaxed to yield an audio signal gets put onto CD (complete with LP surface noise in some cases)! AND you can buy portable CD players for as little as $79.95. Hifi? Yeah, right...

DVD shortcuts

Now of course we have DVD and, true to form, the distributors are ALREADY starting to take production shortcuts with their releases, one example being the 4% speedup complained about by Kevin Attwood in the December issue. It sure didn't take them long...

As he and some of your other correspondents suggest, the problem of 24fps film vs 25fps video has been with us since the dawn of TV broadcasting. For a long time there was simply no practical way of correcting the 4% sound speedup problem, and CCIR TV studios simply pretended it didn't exist!

The pretence has been almost 100% successful with generations of viewers, so when practical methods of solving the problem finally did become available, nobody seemed to be in any particular hurry to take advantage of them. The general feeling was that there were a lot of better things they could be spending their money on, than that particular 'non-problem'...

There are two possible options: either find a way to correct the audio pitch directly, or run the film at the correct speed and artificially increase the frame rate by means of some sort of digital frame store.

The first option is not really practical for complex soundtracks containing multiple voices and/or music, particularly in light of the quality requirements of 'Home Theatre' type sound systems. (Although digital pitch altering devices have been available in recording studios for at least 20 years now, they really only work convincingly with a single voice or instrument).

Accurately correcting the frame rate instead requires a special digital frame store that can hold at least one second's worth (24 frames) of film images. From this you can generate 25 frames per second, by reading the pixels out at a slightly faster rate, and introducing a small amount of 'crosstalk' from adjacent frames to synthesise 25 distinct frames.

In the past, this was a pretty big ask for something that was meant to solve a problem that most viewers seemed to be blissfully unaware of, and considering that nearly 32M of high-speed RAM was needed to give full PAL broadcast performance. Even 10 years ago this would have been considered an outrageous amount of memory, although that amount of RAM is PC 'entry level' these days...

A second and more subtle problem is that the frame rate of the studio's existing telecine machine would have to be altered to scan at 625 lines and 24 frames per second. Most telecines work in only two modes: 24fps film and 30fps/525-line video (for NTSC using 3:2 pulldown), or 25fps film and 25fps/625-line video (for CCIR/PAL).

Modifying the telecine to run the new frame/line rate is fraught with difficulty. At the very least, substantial modifications to the telecine's sync generator would be needed. Not only that, but 24 frames per second of 625 lines each gives a line frequency of

15kHz (instead of PAL's 15.625kHz). This new line frequency would cause all sorts of problems with the various delay lines used for detail correction, etc. With more difficulty the telecine could be modified to run at 650 lines and 24fps which would restore the correct line frequency, but then there would be 25 extra lines per frame to dispose of!

Yet another problem is that the resultant 'oddball' video signal could not be recorded on a conventional video recorder, which means the MPEG encoding would have to be done directly off the telecine — you couldn't just send a 4:2:2 digital cassette copy out to a specialist encoding facility.

The bottom line is that you would have to go to an awful lot of trouble if you wanted to eliminate the pitch alteration problem without introducing other problems. And as I mentioner earlier, in practice this is simply not a problem that many people worry about or even are aware of. Just because a new distribution medium (DVD) has become available, I don't really see any of this changing all that much!

More DVD problems

And DVD introduces yet more problems! Transferring a movie to DVD is not just a matter of hooking up an MPEG encoder to a telecine machine or other video source and making a simple recording. As good as it is, there will still be occasions when the MPEG encoder's computer will 'stumble' and produce a glitch in the picture.

There are various reasons for this, but they all stem from the CPU being asked to do too much at once due to some anomaly in the video content. (Fast zooms on 'busy' backgrounds are one such source of grief.)

If the movie is intended for mass distribution, the distributors can usually justify the cost of hiring a professional 'compressionist' — a video editor who specialises in 'massaging' out such glitches by manual intervention. However producing true separate 'PAL' and 'NTSC' versions of a movie would require this process to be repeated for both standards, since the errors would not necessarily occur in the same places. This would be on top of the extra expense involved in doing the 24/25 transfer process. It's much cheaper to just use the 'NTSC' encoded data for both!

The irony of all this is that the problem of 'speeded-up PAL' only became 'possible' because the kindly DVD manufacturers thoughtfully decided to build multi-standard capability into their machines — allowing 'NTSC-market' discs to be played on PAL machines by running the disc 4% faster and repeating every fifth line of video to make up the missing 100 lines. It was certainly never their intention that this would become the normal standard for distribution for PAL countries; but it sure hasn't taken the disc manufacturers long to cash in on the situation!

(If you want me to be a total curmudgeon, does anybody want to take bets on when we see the first PAL DVDs mastered off composite NTSC videotape? :-)

As for Neville's experience with the Pioneer DVD, I have no direct experience with these machines, but is it possible that it solves the speedup problem by generating the output as 650-line 24fps PAL? (He can soon find out by attempting to record the signal on a VCR. If it's 24fps PAL, he should get sound but no playback picture — just a lot of horizontal lines).

I've had quite a bit of experience modifying standards converters and video cameras to produce this standard for use on film sets (so the image of the picture on the TV screen doesn't show irritating roll bars on the film) and I have yet to find a TV set or monitor that doesn't work on 24fps PAL video — in fact I don't think I've ever even needed to adjust the vertical hold.

If that is what is happening, it would be an excellent idea if the 24fps PAL option became 'standard issue' on all DVDs. That is, it should be able to detect 24fps-originated footage and switch the frame rate accordingly if the owner has 'authorised' it to. (The switching has to be automatic, otherwise 25fps-sourced material will then play too slow!)

PAL/NTSC confusion

Regarding his comments about people arguing that 'the PAL picture, being superior to NTSC offsets the fact that that they have to speed up the movie' etc, I think they're all a bit confused there. What is actually on the DVD is a set of digital codes that describe how to construct, and then modify, a series of still pictures so that they approximate the original series of pictures on the film. (How close this approximation is, largely depends on the data rate available.)

For generating NTSC video, the instructions specifically refer to video frames containing 475 active scanning lines (the other 50 lines of 525 line NTSC contain the vertical sync pulses).

To make this into PAL they simply repeat every fifth line of video to give approximately the 575 active lines required for PAL. The PAL picture therefore contains no more information than the NTSC one, but does contain some geometric distortion.

(Continued on page 97)

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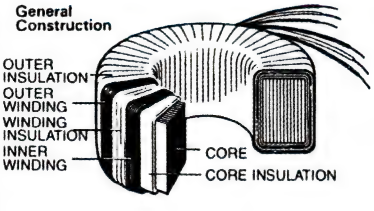

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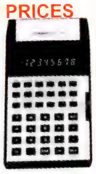

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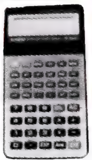

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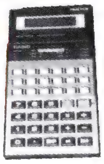

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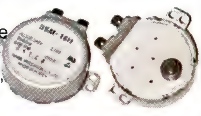

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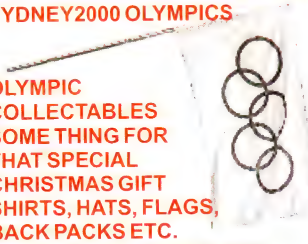

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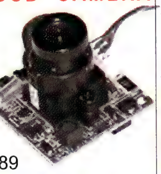

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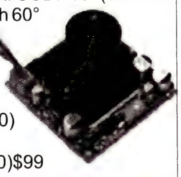

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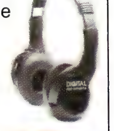

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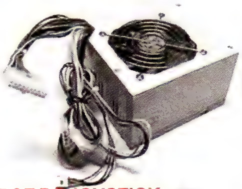

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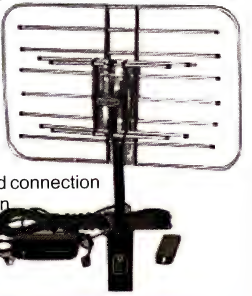

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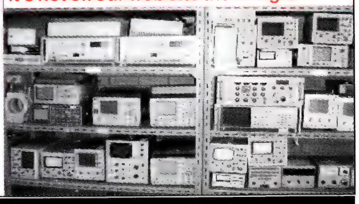

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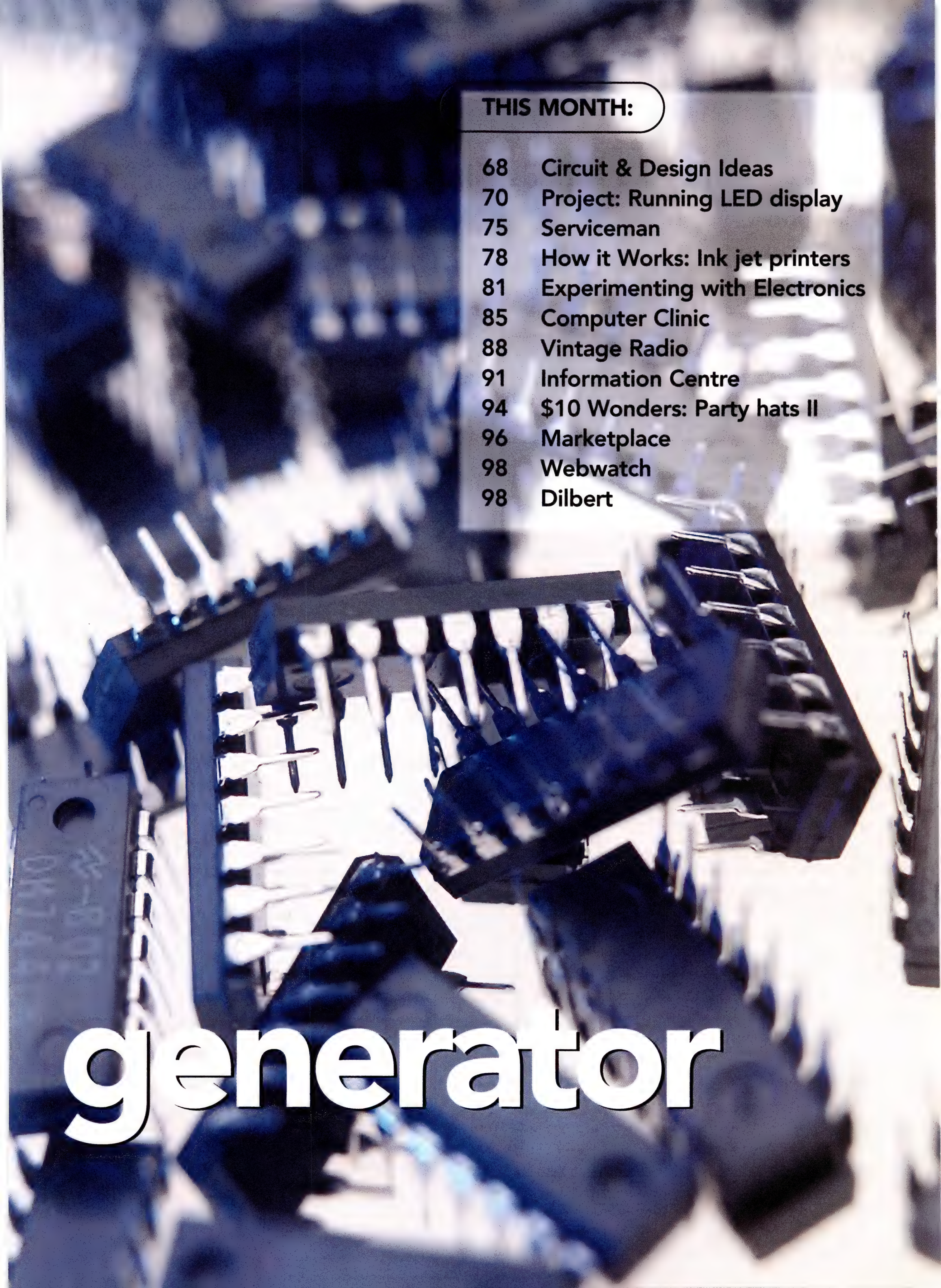

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CIRCUIT & DESIGN

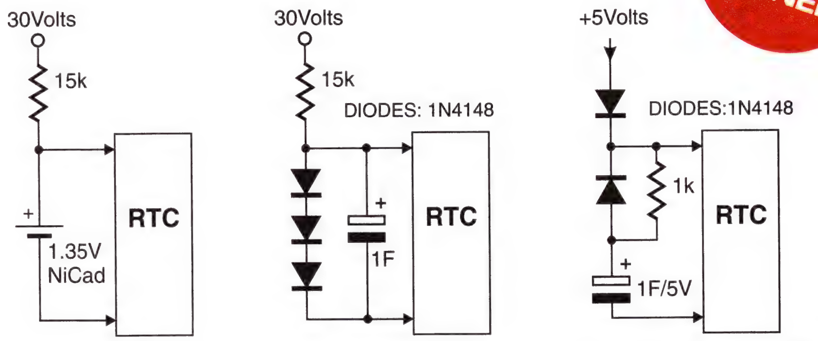
Replacing NiCads with a Super Cap

THIS MONTH'S WINNER!

I HAVE SEVERAL Arlec digital mains timers/switches (PC787) dating back to 1996. Some of these units had ceased to operate due to the on board NiCad cell (1.35 Volts) refusing to charge. Replacing the faulty cell initially fixed the problem, only to reoccur 9 months later.

Replacing the single NiCad cell with a 'Super Capacitor' fixed the problem. Elna makes the one I used; it's a 1.0 Farad 5.5 Volts low-leakage electrolytic capacitor, although NEC make similar units. They are readily available from retailers such as Dick Smith and Jaycar for less than $7.

NiCads maintain a voltage of around 1.35 volts per cell depending on charging current. To prevent damage to the digital controller's internals, the voltage across the Supercap must be limited to around the original NiCad cell(s) voltage.



Original circuit

Modified circuit

Computer 3.6V NiCad replaced by Supercap

The simple solution I chose was to place forward biased, low-leakage silicon diodes in parallel with the capacitor. I found that three general-purpose 1N914/1N4148 diodes did the trick for the Arlec timers, as this limits the maximum voltage across the capacitor (and the internal Real Time Clock 'RTC') to around 1.8 volts.

Silicon diodes practically cease to conduct when the forward voltage drops to around 0.5 volt, so this causes the capacitor voltage to drop to around 1.5 volts within minutes (for the circuit shown). However the voltage then decreases very slowly, providing sufficient energy for the RTC for at least 12 hours — in the case of the Arlec PC787 unit.

$30 voucher from Jaycar ELECTRONICS

This approach should also work for other timers and RTCs using NiCads for battery backup.

Computer motherboards fitted with 3.6 volt NiCads are particularly nasty. Most NiCads eventually leak and cause major damage to components, and printed wiring tracks. Fortunately, these motherboards are easily converted by replacing the NiCad cells with a super capacitor.

H. Peter Harle
Mt Druitt

Simple power supply cut-out switch

THIS SIMPLE cut-out switch can be adapted to virtually any power supply. To operate the circuit, the momentary press button PB1 needs to be pushed to turn the SCR on, which pulls the relay in.

If the output is short-circuited for any reason, the voltage across the SCR's anode/cathode drops to virtually zero. The SCR then turns off, and the relay switches the output off. There is no risk of damage to the power supply while the short-circuit condition remains, due to the fact that the relay and SCR will not switch back ON — to reset the circuit, press PB1 again.

The relay coil voltage should match the output voltage of the power supply.

I added this circuit to a home-made 13.8V @ 20A power supply. The main benefit of this circuit is that it saves the hassle of replacing fuses and the output is switched off instantly, reducing the risk of damage to the regulator components.

David Tindall
Buderim, QLD

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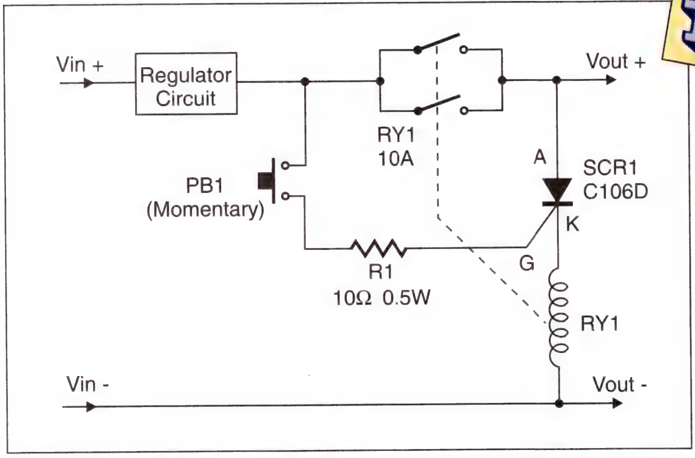


CDI ERRATA

Simple 240V light chaser switches at zero crossings (November 2000): The author has pointed out that there were a few errors in the schematic diagram for this CDI item. The 56k resistor at the collector of the BC557 should be 5.6k, and the lower end of the nearby 220k/1W resistor should join to mains neutral line (N) rather than the 0V common line (pin 8 of the 4017 counters). Also, the 220k resistor at the SCR gate should be 220 ohms.

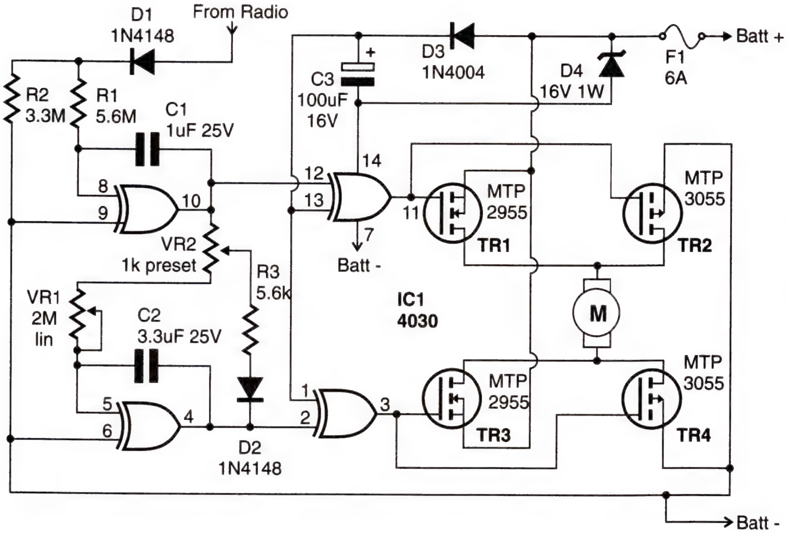
Interesting original circuit ideas and design tips from readers. While this material has been checked as far as possible for feasibility, the circuits have not been built and tested by us. We therefore cannot accept responsibility, enter into correspondence or provide any further information.

Power Antenna Controller

$30 voucher from Jaycar Electronics

I DESIGNED this unit to take the place of the manual switch in a semi-automatic car power antenna. The circuit as it stands is suitable only for 'off the shelf' reverse voltage types, usually fitted after car's been purchased. It could also be used in any logic-operated DC motor reversal system such as automatic garage doors, etc. It offers both up and down delay, variable height and fully automatic operation.

When the radio is off both terminals of the motor are at 0V, with TR1/3 off and TR2/4 on. The delay circuitry is based on R1/C1 at pin 8 on the 4030 XOR gate, while the motor runtime is set by components C2 and VR1. With the radio on, after about 4 seconds C1 goes to VDD/2, where pin 10 goes high taking output 11 low, which switches TR1 on and TR2 off. This starts the 'up' movement, which continues until the timing cap C2 goes to VDD/2 taking pin 4 high, and output 3 low. This switches on TR3 (and TR4 off), so that both terminals of the motor are high and movement stops.



At the down cycle (radio off, control line to 0V) after about 7 seconds C1 discharges to VDD/2, then output 10 goes low and pin 11 high, switching on TR2 and commencing the retract movement. This continues until C2 discharges to VDD/2 when output 3 goes high switching TR4 on and returning the circuit to its rest position. VR2 allows for some adjustment of the up time to balance the movement of the antenna. Two or three overrun 'clicks' at the finish of the 'down' action are desirable to make sure that the retraction is complete.

When the antenna is up, moving the 2M pot will only alter the down time. If the antenna is to be extended it must be retracted, and then moving the 2M pot will extend it fully if required. The MOSFETs specified should be OK without heatsinks for currents up to about 4A, assuming a worst case duty cycle of around 20% (if junior decides to play with it!). Power should be connected before the antenna. There is no tendency for the MOSFET bridge to short because of the Schmitt switching action of the logic. 3.3uF 25V ceramics are made but hard to come by, so I used 3 x 1uF units in parallel.

Terence Weir
Haberfield, NSW

Recycling suggestion

RECENTLY I discovered that applying heat to an empty plastic soft drink bottle causes it to shrink to about half of its original size. I've found that by cutting the middle section of the bottle to form a tube, I was able to use it as a substitute for large heatshrink tubing when making up battery packs.

I'm sure that with the vast number of shapes and sizes of these bottles available, there are many other applications for this suggestion.

Joe Curulli
Cannington WA

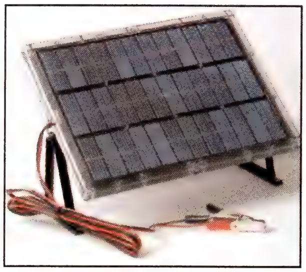
$30 voucher from Jaycar Electronics

This issue's 'IDEA OF THE MONTH' prize from Jaycar Electronics

Three 4.5 watt 12V solar panels (cat: ZM-9018) - valued at around $300!

These amorphous-silicon solar panels are rated at 12 volts each, with a current capacity of up to 250mA. They're ideal for remote power situations and battery charging in boats and caravans, etc.

The cell array is sealed in a strong plastic case (187 x 255 x 17mm), and can be mounted on any suitable flat surface. Supplied with blocking diode and brackets.



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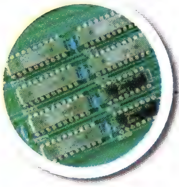


CONSTRUCTION **PROJECT**

BY EDGAR PETRONE & JOHN MANDUCI

Moving-Text Display

It's almost impossible not to notice a moving-text electronic display, isn't it? The movement seems to attract your eyes to them like a magnet. Here's how to build a very effective unit for yourself, at low cost. It's self contained, operates from 12V DC and storing whatever text you want to display is quite easy.

YOU SEE THEM every day — in shops, buildings, pubs, you name it. We all want to say something in public to attract attention. What better way is there to do it than with a moving-text display?

The big advantage of this display over others is price. Because you assemble it yourself, the unit is priced at only $179. Also you don't even need to own or buy a computer to program the display. It's easy, simple and fun. No computers are required and there's no fiddling with software. You can change the message on the fly wherever you are. It makes an excellent way to advertise your business, club or whatever.

Since the unit is fully self-contained and only requires a nominal 12V DC power supply (9-15V), there is nothing stopping you from wiring it inside a motor vehicle, connected to your car's battery. You become a mobile advertisement, and the display is particularly eye catching at night.

Other features include the ability to store display messages up to 511 characters long; non-volatile memory which stores the messages for years, even when the power is removed; outstanding brightness from the LED arrays used to display the message; a character set of over 60 different letters, figures and symbols; and a choice of 16 different scrolling speeds.

The circuit

At the heart of the circuit is the Atmel AT90S8515 AVR microcontroller. The AT90S8515 can perform up to eight million instructions per second and has 32 I/O lines, 8KB of program memory, 512 bytes of RAM and 512 bytes of EEPROM memory in which the display message is stored, even when the power is switched off.

(Note: The maximum message length is 511 characters because one byte in the EEPROM is reserved to store system settings such as the scroll speed, which is also maintained at power off.)

The display uses eight LED array modules, with each module containing 35 LEDs in a 5x7 matrix. These are arranged so the total display has seven rows by 40 columns of LEDs, which makes a total of 280 LEDs.

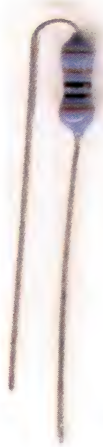
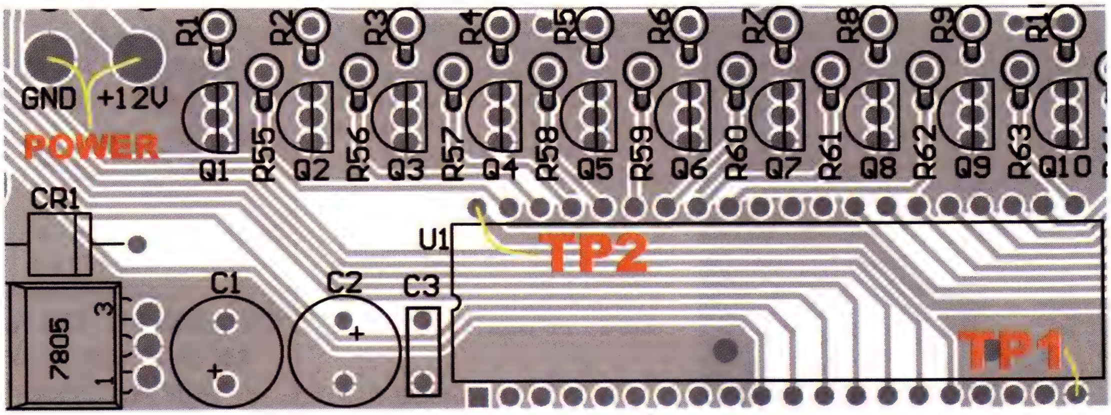


Fig.3 (above right): Bend the resistors like this!
Fig.4 (below): A close up of the power supply section, showing the component positioning, plus power and test point locations.



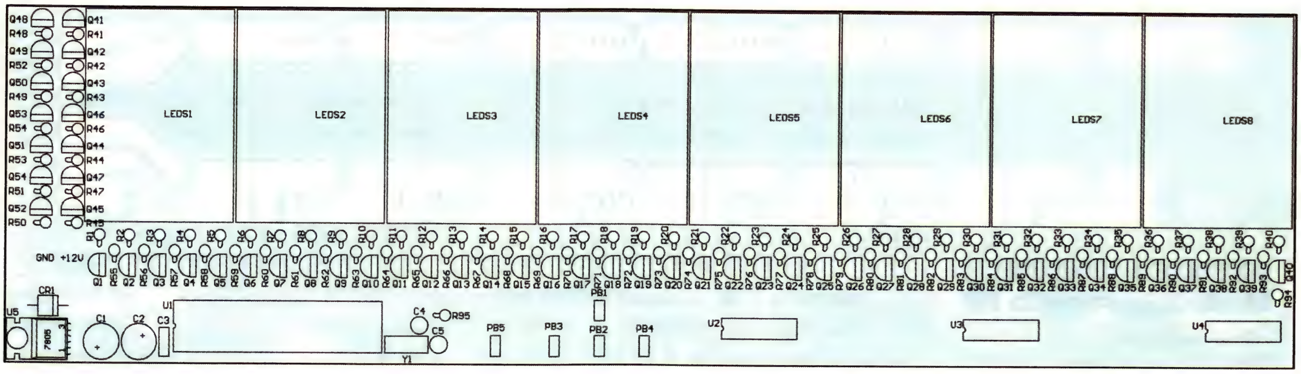


Fig 2: Follow this component overlay diagram carefully when putting the Moving Display together. May sure you're looking at the component side of the PCB when you start installing components...

This addressing arrangement means that the AVR microcontroller does not need to drive each LED individually, but via a row-and-column multiplexing system. So instead of needing 280 lines from the AVR, we only need 47 (40 + 7). However since the AVR has only 32 I/O lines, we needed to find another 15 lines plus a further five for the control switches used to feed in the text, etc.

To get around this problem three 74LS164 shift registers are used, driven in serial fashion from two of the AVR's I/O lines (PB0 and PB1). The registers provide a total of 24 additional column-address lines for the display (columns 17-40). The first 16 columns are directly controlled by the AVR (PA0-7 and PC0-7). Seven of the AVR's remaining I/O lines (PD0-6) are used to address the display rows, while five others (PB1-5) are used as input lines for the control buttons. The two remaining AVR lines (PB7 and PD7) are not used.

The AVR controls the multiplexing so that only one row of LEDs is ever on at one time. First it turns on row 1 and all the other rows off, and then turns on the corresponding columns for row 1 of all characters currently being displayed. The data for columns 1-16 is supplied directly, but in order to control columns 17 to 40, it must shift data out through the three shift registers via their clock and data pins.

After row 1 is displayed for a short period the AVR will switch off row 1 and then repeat the procedure to display row 2. It then goes on to repeat it again for the remaining rows, and then loops back to row 1. This is done very quickly, to fool your eyes into believing they are seeing all rows at once.

In reality, then, each LED is only ever on 1/7th of the time — which would normally reduce the brightness to 1/7th. To compensate for this, the current that drives the LEDs is increased.

Every LED is allocated one binary digit (bit) in the AVR's display memory. Since each bit can be either on or off, this means all we need to do is set that bit on or off and the corresponding LED will be turned on or off.

The display is not driven directly from the regulated 5V supply used to run the AVR and shift register chips. Rather, the row transistors (Q41-47) which switch positive voltage to the display are connected to the actual supply voltage (9-15V). This way the display can be driven much brighter without causing the regulator to overheat and possibly fail.

Construction

To begin assembly, hold the circuit board so the copper side facing you looks like the one visible in Fig.2. This is the front of the board, and if you orientate it so the corner with a 3mm hole is at lower left, you'll be looking at the board the right way up as well.

The overlay diagram of Fig.2 will now be your guide to placing the components on the board in the correct positions and with the correct orientation. All components will be inserted from the front of the PC board and are soldered at the rear.

First we'll be fitting and soldering in the PN100 (NPN) transistors. Do the row transistors Q48, Q49, Q50, Q53, Q51, Q54 and Q52 first, then column transistors Q1-Q40. Before soldering each transistor in, first push them down so they sit comfortably close to the PCB, without straining their leads.

Now it's time to fit some of the resistors. But before doing so, first bend their leads ready for vertical mounting — i.e., so they look like the resistor in Fig.3. Also the finished product will look much better if you orientate each line of resistors so that they all face in the same direction.

PARTS LIST

● capacitors

C1	10uF 25VW tantalum
C2	1uF 10VW tantalum
C3	0.1uF MKT
C4,5	22pF NPO ceramic

● resistors

R1-40	220 ohms (or 1k)
R41-47	560 ohms
R48-54	15k
R55-95	4.7k

● semiconductors

CR1	1N4004 diode
Q1-40, 48-54	PN100 NPN transistor
Q41-47	PN200 PNP transistor
U1	AT90S8515-8PC 8-bit microcontroller
U2-4	74LS164 shift register
U5	7805 5V regulator
LEDs1-8	TC20-11SWA 5x7 LED array or similar

● miscellaneous

Y1	6MHz crystal
PB1-5	Pushbutton switch, SPST tactile

PC board, double sided 325 x 88mm; coaxial DC input connector, 2.5mm; 40-way DIL socket for U1.

NOTE: The PCB design and firmware used in this project were developed by the authors, and copyright to each is held by their company Enetgenic. However complete kits for the project will be available from Jaycar Electronics stores.

First solder in resistors R55-R95, the base transistors for the column drive transistors Q1-Q40 and also the reset pullup resistor for U1. These are all 4.7k. Note that R95 is located just to the right of U1, near C4 and C5.

Now fit and solder in R48 to R54. These are all 15k.

Next fit the PN200 (PNP) transistors, Q41 to Q47, together with their base resistors R41 - R47. These are all 560 ohms.

Now you can fit the column pulldown resistors R1 - R40, which are all 220 ohms.

Now fit and solder in CR1, which is a 1N4004 diode — taking care that it is facing in the right direction (see Fig.4). Also fit U5 the 7805 voltage regulator. You will need to bend the leads of the regulator down at right angles about 3mm from the body, so it will fit snugly in the corner with the hole in its mounting lug above the hole in the board. You may also wish to fix it down to the board with a 3mm screw, nut and washers. There's no need to insulate the regulator from the PCB.

Now fit and solder in capacitors C1 (10uF), C2 (1uF), C3 (0.1uF), C4 and C5 (both 22pF). Note that C1 and C2 are both polarized and should be orientated correctly by following Fig.4.

Next fit and solder in Y1, the 6MHz crystal. Then fit and solder in pushbutton switches PB1 - PB5. Solder these in so that the sides of the switches without pins are towards the top and bottom — i.e., parallel to the long axis of the board. Before soldering any of them, it is a good idea to insert them all and if necessary nudge them until that they all look neatly aligned.

Now fit and soldering in the 40-pin socket for U1, ensuring that its orientation notch is facing towards the left (i.e., towards C2 and C3). Then you can also fit and solder in the 12V DC input connector, which goes just below R50 and R45, and a little above CR1 (see Fig.4).

You should now be ready to do a voltage check. Apply 12V DC power to the PCB via the connector (positive to centre pin). Then connect your multimeter or DMM so that the negative lead is connected to TP1 (bottom right pin on U1 socket) and the positive lead is connected to TP2 (top left pin on U1 socket). You should read +5V.

If you do, remove the power supply and resume the board assembly by fitting and soldering in U2 to U4, the 74LS164 shift registers, taking care to insert them in the right direction. In this case their notches or 'dimple' ends should be towards the left — i.e., facing the pushbutton switches and Y1.

Now you can insert U1 (the AT90S8515 microcontroller) in its socket, observing the usual precautions to prevent electrostatic damage. Also make sure you insert it so that the notch and triangular symbol are on the left, towards C2 and C3.

You'll now have reached the final stage of assembly, which is to fit and solder in the actual display modules — LEDS1 to LEDS8. Here you should take special care to ensure these are fitted in the right direction, with the narrow end carrying their part number facing DOWN, towards column transistors Q1 - Q40.

Take special care also not to bend the pins on the display modules, otherwise it will be difficult to insert them into the PCB. The easiest way to get them in is to insert the row of seven pins closest to the top edge of the board first (do not push them in all the way, just slightly in the holes) and then gently ease the lower row of pins into place. Do not try to force the pins, otherwise you may bend them. When both rows of pins are cleanly inserted in their holes you can then push that module down until its body is resting against the top of the board. Then you can solder the pins to their pads.

Finally once you have soldered all eight display modules in place, re-apply power to the display and you should be rewarded immediately by seeing the following message scrolling: 'MOVING ELECTRONIC DISPLAY'.

You should now be able to use the pushbutton keys to alter or clear this message and create a new one.

Operation

In operation, full control of the display is achieved via the five on-board pushbutton keys. The single key on the left (nearest the crystal) is a 'shift' key, and is used in conjunction with the uppermost of the other four keys to toggle the display between each of its two operating modes: 'RUN' and 'EDIT'. The functions of the various keys in both modes are shown in Fig.5.

By default the display will always go into RUN mode whenever the unit is powered up. This is the normal operating mode, where the display simply scrolls your stored message from right to left at the speed you've programmed.

To create a new message or edit an existing one, you must toggle into EDIT mode by holding down the shift key while pressing the up-arrow key. You will know you are in EDIT mode when you

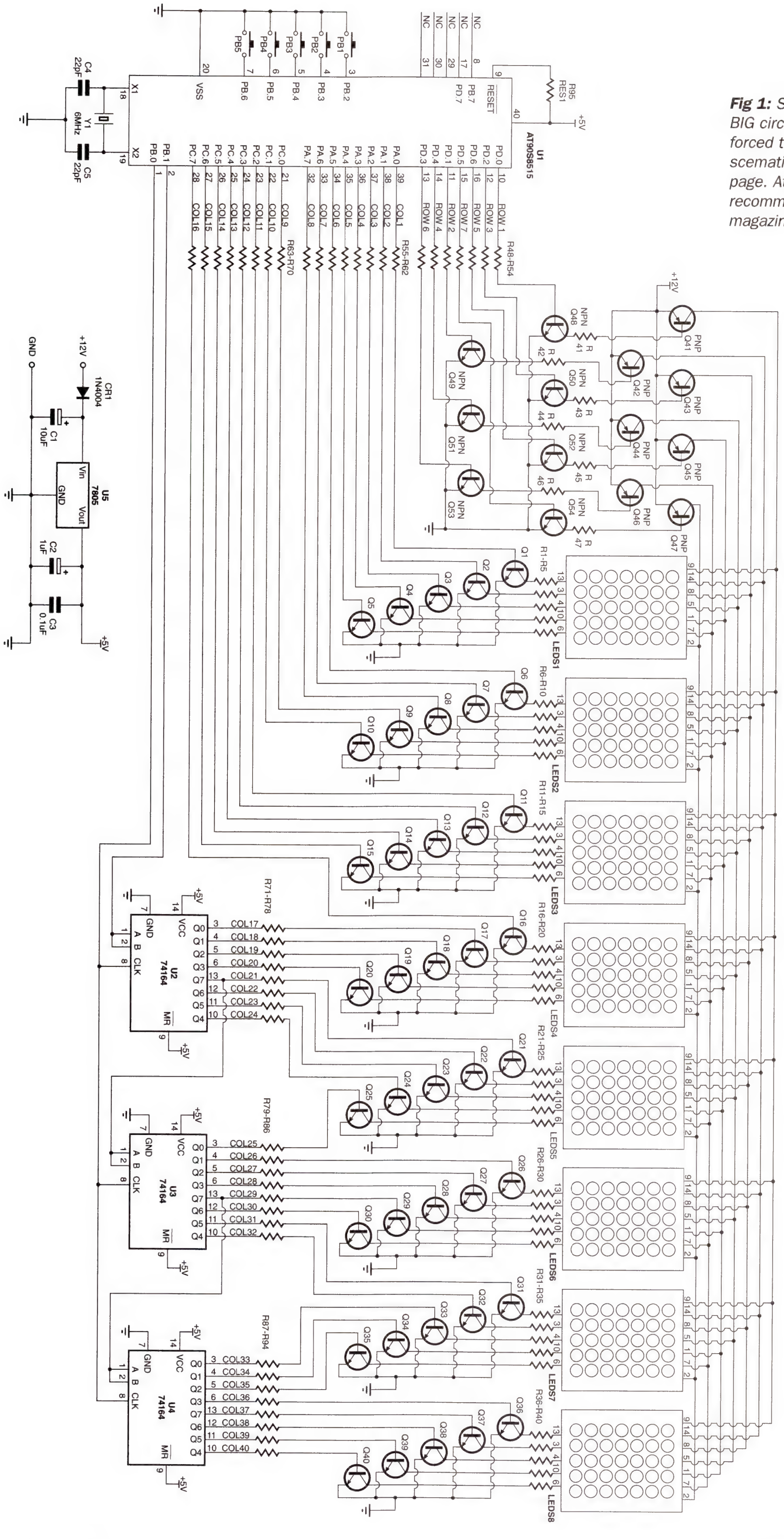


Fig 1: *Sorry folks, but it's a BIG circuit, so we were forced to publish the scematic vertically on the page. At this point, we'd recommend rotating the magazine by 90° CCW.*

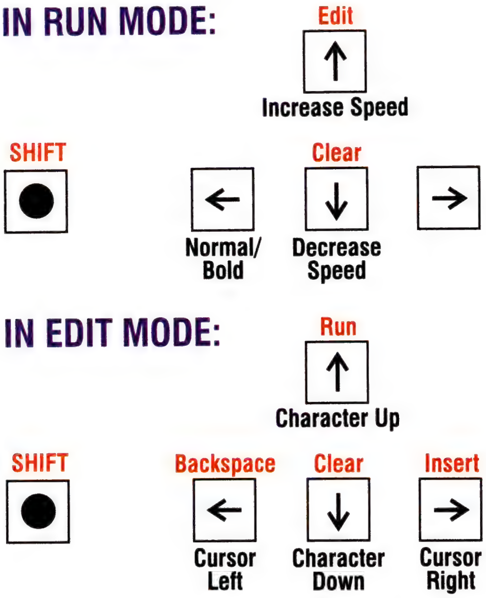


***Fig 5:** The button functions in the Run and Edit modes. Use this as a reference when operating the Moving Text Display module.*

have a flashing cursor. When you've finished editing your message, holding down the shift key and pressing the up-arrow key again will store the message and switch the display back to RUN mode.

In EDIT mode, pressing the up- or down-arrow keys will allow you to select the character you want in the current cursor position. Pressing the left- or right-arrow keys will move the cursor one position to the left and right. When you hold down the shift key, the arrow keys have alternate functions. Shift-left will *delete* the character to the left of the flashing cursor. Shift-right will *insert* a new character to the right of the flashing cursor. Shift-down will *clear* (erase) the entire message.

As you can see, in this mode the keys provide all of the functions you should need to store or edit any desired message.

In RUN mode, the message you have stored will scroll across the display from right to left. Pressing the Up or Down keys will vary the speed. You have a choice of 16 speeds. Pressing the left arrow key will give you bold characters where possible. Pressing left again will return you to normal characters. Shift-Down will delete the entire message and return you to edit mode.

Troubleshooting

If you follow these instructions, your moving text display should function correctly as soon as it's powered up. However if for some reason your display doesn't seem to be behaving as it should, here's some suggestions for troubleshooting:

With your multimeter or DMM, check that there is +5V present at pin 40 of the AVR chip (U1). If the voltage is not correct, check that there is +12V at the power input socket. If there is +12V, check the polarity of diode CR1 or the fitting of U5; one of these may be fitted incorrectly. Otherwise you may have a short circuit on the +5V line, somewhere on the board.

If you have +5V present correctly, but there's no display, check that resistor R95 has been fitted correctly and that crystal Y1 has been soldered in correctly. Otherwise check that C4 and C5 have been soldered in correctly, and also that all pins of U1 have been plugged correctly into its socket. Check too that U1 is plugged in the correct way around, with the 'notch' and 'triangle symbol' end nearest to C2 and C3.

If the display is working but the LEDs glow only dimly, check that you have at least +9V at the power input socket. Then check that all of the resistors are of the correct value.

If one of the LED array modules does not light up at all, the most likely cause is that this module was fitted to the board around the wrong way. It will need to be removed and replaced with the correct orientation.

If a complete *row* of LEDs doesn't light up at all, check the transistors used to switch current to that row, and their resistors. For example if row 1 is dead, you'd check Q41 and Q48, plus R41 and R48; if row 2 is dead, you'd check Q42, Q49, R42 and R52, etc.

Similarly if one or more *columns* doesn't light up at all, check that ths display module concerned isn't fitted to the board the wrong way around. Otherwise check the corresponding column drive transistor and its resistors, directly below the row(s) concerned.

If eight consecutive columns in columns 17-40 of the display remain dark, check the corresponding shift register chip. Note that U2 controls columns 17-24, U3 controls columns 25-32 and U4 controls columns 33-40.

Finally if one or more of the pushbutton switches doesn't work, check that the switch(es) concerned have been soldered in correctly.

These troubleshooting tips should allow you to solve any conceivable technical problems that could arise with this project.

However if you try them and still can't get your display working, you can email the authors at **enetgenic@hotmail.com** and we'll try to help. **ea**

SERVICE**MAN**

Troublesome **transformers**

Big and bulky, power transformers are seldom the cause of problems in domestic appliances — and when they do go bung, they usually do so in a rather spectacular manner as happened in our first story. But as you'll see in our second, transformer problems aren't always that obvious...

THE FOLLOWING STORY should, by rights, have gone to Roger Johnson for his 'Vintage Radio' column. Then I thought "Why should Roger have exclusive rights to restoring veteran equipment?" After all, this is as much a servicing story as a restoration one.

So Roger misses out this time. He can have the next one that comes in! The story comes from a New Zealand reader who asked that we not use his real name with the item. So I've chosen to call him Mr A. Nonymous.

Mr Nonymous opens his story with a quote we have all heard at one time or another. It goes like this...

"I have an old valve radio at home which I was wondering if you could fix. It doesn't go, but the tone is so much better with old valve radios".

So went the question put to me by one of my work colleagues. It must have been a moment of weakness for I said "...bring it in and I'll see what can be done".

The radio duly arrived, an old Courtney manufactured by Radio Corporation of New Zealand, a model 27 to be exact. So it followed me home to the workshop bench where it was up ended and it's chassis removed.

What a mess! As with all too many of these otherwise magnificent radios the power transformer had gone up in smoke, or more likely flames judging by the burnt material on the underside of the chassis. The transformer was completely burnt out and many of the surrounding components showed severe heat damage.

The first problem was to find a replacement transformer. Putting the word out among the local collectors soon located a suitable unit, still with 'Army Dept.' written on the underside paper insulation.

Apparently the transformer was from an old Army Morse training set, built during WWII and later sold as scrap. As it turned out, it was not an exact replacement and resulted in a slightly lower High Tension voltage.

But I am getting a bit ahead of things so back to the burnt chassis. Paint thinners were used to clean away a lot of the residual wax etc. left by the fry-up. This resulted in a much cleaner chassis.

Although there was still evidence of damage, it was decided that this was as good as the chassis would get without re-plating. Then it was on with the replacement transformer and a new mains tag strip.

The filter electrolytics, all of the capacitors and some resistors that were out of tolerance were replaced. It was then time to fire up the power supply.

As with many of these old sets, the speaker field coil is an integral part of the power supply circuit providing inductance as a part of the filter system. At the same time it provides a magnetic field for the electromagnetic speaker.

Before plugging in the speaker, a brief examination of the leads revealed some very badly deteriorated insulation on what is of course high tension wiring. So there was nothing for it but to remove the speaker from the cabinet to replace the wiring.

Nailing the problem

When the speaker was removed a big surprise was in store for me. Some time in the past some one had apparently decided that the way to cure what I imagine was a rattley speaker was to bend up a 2-inch nail and epoxy glue it on to the speaker pole face in such a way as to restrict the speaker's cone travel, thus hopefully reducing the rattle.

So now we had a partly repaired radio without one of the major components needed to complete the rebuild. So another call went out to a local collector who turned up a replacement 8 inch speaker with the same field coil resistance.

A Sunday afternoon trip down the bay to collect the speaker meant that once again work could proceed. The new speaker was duly installed, the valve sockets were all cleaned and re-tensioned to ensure good contact with the valve pins.

Finally it was power up time. Fortunately all was well and I was greeted by music from one of the local stations. After a bit of time spent realigning the set it performed very well.

However, on an extended soak test it was found that occasionally it stopped working. It seemed that the local oscillator was dropping out. So a new valve was installed and there has been no further trouble.

The owner has taken the radio back into his care and instead of using it in his potting shed as was the original idea, it now has pride of place in his home office.

The cabinet was a bit marked with odd spots of paint splashed here and there. But short of a full re-polishing job there is not much that could be done. All too often re-polishing the cabinet of an old radio *spoils its authenticity.*

I normally work in the computer field where I have been employed for more years than I care to remember. However as a Registered Electrical Technician I still from time to time follow my interest in old radios and audio equipment.

So there you have it - how to repair a fine old radio, and where to source hard-to-find parts for same.

A few years ago most restorers were on their own with regards to sourcing parts for old sets. With the popularity of restoration as a hobby, there are now collectors groups whose members know where almost anything can be found.

For a time I was known as a source of old valves but keeping up with requests for supply and information was taking too much of my time. So I gave the collection away to a keen associate. I also had a good collection of 1, 2 and 3 gang tuning 'condensers' but they have long since been used up.

I can quite imagine how chuffed Mr Nonymous was when the old radio burst into song. As I mentioned last month, there is an attraction about old technology and making it work properly again.

Now we come to a story from long-time contributor Peter Lankshear. Readers will remember Peter as author of the Vintage Radio column for many years. He retired a few years ago but still contributes an occasional interesting tale. This one is no exception — here's what Peter has to say...

Dead Kenwood

This contribution was prompted by a story in the April 2000 EA about a quest for a TV receiver for a solo mother. Not so long ago I became involved in a repair job for a solo mum that had a surprise and raised some concerns.

The heroine of this story, whom I know quite well, has a teenaged daughter who is a keen and successful ballet student, with a display cabinet of silverware to prove it. Consequently, a Kenwood CD and tape deck is a much used part of the household equipment.

Last year, the mother approached me for advice regarding the Kenwood player. It seems that it had died and she had taken it to a major repair organisation who, after charging her an up front inspection fee, told her that the amplifier needed a new power transformer, and their quotation to do the work was for an additional $400!

The household budget would have been considerably stretched to meet this sort of expense, and consequently the daughter's future in ballet was threatened. The inevitable question was: would I mind looking at the set and give my opinion?

Of course I agreed, but with the proviso that I would make no promises until I had evaluated the situation. With a quotation of $400+, I envisaged some pretty severe damage and the possibility of my advising the purchase of a replacement player.

It did not take long to remove the covers of the amplifier and discover that there was no widespread damage. In fact, apart from the various connections to the transformer being unplugged, there was no physical indication of anything being wrong.

A close inspection showed that there had been no smoke or overheating, the usual signs of a damaged mains transformer. It also did not take long to ascertain that the primary winding was open circuited, in my experience a very rare fault in medium sized transformers such as this.

At this stage I agreed to repair the unit and asked about the exact sequence of events and was told that the player had been operating at a volume level a bit higher than normal when suddenly the system just died.

Mum had been out at the time, so 'a bit higher' could mean anything, but with the absence of any signs of overheating, I did not place much importance on this and the for the moment, the exact cause of the fault remained a mystery.

In my experience, high level operation of domestic equipment was more likely to destroy output transistors rather than power transformers. In any event, with my usual reluctance to throw away rather than repair, a rewind seemed to me to be the next move.

I considered doing this with a hand winder, but the transformer had been thoroughly sealed with resin and the bobbin, an odd size for which I did not have any spare, would not be likely to have survived salvage of the core.

As related in a previous story about a Radford amplifier, I am fortunate in knowing a transformer rewinding expert and I phoned him for advice. In his usual positive manner, he said "send it up" and quoted a very reasonable charge for the job, well within budget.

The repaired transformer arrived back promptly, complete with the various connectors carefully reattached to their leadout wires and it was soon reinstalled with a total labour time of about 15 minutes. When fired up, everything appeared to work correctly.

Cut it out!

Up to this point, apart from the original price quoted for the repair, the story is unremarkable, but now we come to the interesting part. With the rewound transformer had come an explanatory note.

When the original assembly was dismantled, our expert had found a thermal cutout embedded in the windings!

Here then was the real cause of the problem and the story about the amplifier failing during a period of loud music became significant. Obviously, prolonged heavy drain caused by four largish output transistors had caused some heat in the windings and the cutout had tripped as intended. However, when cool, it did not reset, with dire results.

As there was now no cutout, I fitted a low current slow-blow fuse and returned the unit to the delighted owner with the warning not to entertain the neighbours with it without first inviting them over!.

That was about a year ago and as our budding ballerina is still happily practicing her pas des deux *we can assume that the repair was successful.*

But to me there are some important points of concern... Is the inaccessible interior of a transformer the best place for a cutout, which, being an electro-mechanical device, is potentially unreliable? Is it common practice? There are plenty of well proven methods of semiconductor heat sensing for power transistors.

As I am not part of the service industry, I have no access to manufacturers manuals and, but for my reluctance to buy a replacement transformer, I would not have found out about the cutout. Assuming that I could have purchased a manufacturer's replacement (and that is doubtful) the problem might well have recurred.

And then there is the question of the quoted cost of the repair. I may be out of touch, but a quote of $400 for straight forward repair job such as this seems to me to be excessive to put it mildly. Or was the cost of a manufacturer's replacement transformer itself astronomic?

Certainly the quote may have allowed for the possibility that there might have been further damage to transistors or an IC that would not become apparent until the power supply was operating again, but at most it would have been a few components costing but a few dollars. I am left with some uneasy feelings.

Well Peter, your uneasy feelings are well justified. Open circuit thermal cutouts are (or were) a quite common failure in small-audio products. And occasionally in not-so-small items too!

Unfortunately, I don't know of any skilled rewinders so I have had to use either the manufacturer's replacement part, or devise a suitable alternative for myself.

For example, I have a Sony amplifier, model TA-212A, which stopped for no reason at all. The cutout simply failed. It was an old amp, and the Sony replacement was just too expensive. So I looked around for an alternative.

Unfortunately, there was no alternative to the Sony part because the transformer carried two secondaries — one of 25-0-25 or thereabouts and the other of 0-6.3V, the latter feeding the front panel lamps.

The main primary was easy enough to substitute — several manufacturers offer direct replacements. The trouble was the low voltage secondary.

I could have dispensed with the panel lights altogether — they are not a vital facility. But in the end I fitted a second transformer, a tiny 7VA unit from Arlec. So now I have the only two transformer TA-212A in captivity, and it works like a charm.

On another occasion the ends of the leads on the open circuit cutout were extended outside the windings (they hadn't been clipped off during manufacture) so I was able to attach a fuse in parallel to the dud cutout. That was a quick and easy fix but they don't come like that too often!

Thanks for that story Peter. We look forward to hearing from you again.

Perfect printing

And finally, to round out this month's column, here is the sequel to last month's grizzle about computer printers and things.

If you remember, I commented about a small problem I was having with a 'new' motherboard in one of my computers. I seemed to have an intermittent somewhere in the parallel port which upset the printer.

I found later that the problem, whatever it was, also upset the scanner. In detail, the scanner was plugged into the parallel port, and the printer was plugged into the scanner. This setup was recommended by the scanner manufacturer and had worked perfectly since day one on the old 486 computer.

In fact, I didn't have an intermittent fault at all. It was some kind of incompatibility between the two sets of hardware and their associated software.

If I removed the scanner software, the printer worked OK. Similarly, if I removed the printer software, the scanner worked perfectly, even while the two devices remained connected together. Obviously this was no solution since I couldn't be removing and re-installing the various software two or three times a day.

One solution would have been a distribution box but this was not available late on a Saturday afternoon. So what else could I do?

Then I remembered that there was a plug-in parallel port on the old 486 motherboard. The Pentium S board has a built-in port so I had not thought of the removable one. I connected the scanner to the built-in port and tried it out. It worked perfectly. Then with breath heavily bated, I plugged the printer into the removable port. It too worked as intended.

So I have solved the problem, without actually curing the trouble. There is something mysterious about the built-in parallel port on the Pentium board. It seems that it will only allow one device to be connected at a time. The old 486 and the plug-in port didn't seem to mind how many devices were connected. **ea**

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Inkjet Printers

The development of low cost inkjet printers has seen a revolution in computer printing, with most PCs now able to print out text, graphics and images in high quality colour. Here's how these deceptively simple devices actually work... **by Jim Rowe**

WHEN YOU LOOK inside a typical modern inkjet printer, there appears to be very little in the way of 'works'. Just a couple of stepper motors with gearing, pulleys and toothed belts or cables to advance the paper and move the innocent-looking printhead back and forth across it; and not much else. There's no ribbon, and nothing like the character 'daisywheel' or array of tiny print pins found in earlier impact printers.

Even if you look closely at the print head, all that's apparent in most cases is a couple of replaceable ink containers, each with rows of what look like microscopic pinholes on the side that faces the paper. (Sometimes the holes are in the front of the printhead itself, and the replaceable ink containers are separate.) Plus a multi-conductor flexible cable, running from the printhead back to a small PC board with the printer's microcontroller 'brains'...

Clearly the dots of coloured ink that create the images on the paper must somehow emerge from those tiny pinholes, under the control of the microcontroller. So the real secrets of inkjet printing must be inside the printhead and behind those pinholes, you'd guess. And you'd be right.

Modern inkjet printers have been made possible by developments in two key areas of electromechanical printing technology. One is the ability to micromachine those arrays of tiny pinhole 'micro nozzles' through which the ink emerges to hit the paper; the other is the ability to produce and accurately control very small pressure 'waves' inside liquid inks. And in both cases the technology developed to achieve these goals has been sufficiently elegant and 'simple' to allow very efficient mass production, so the cost of delivering better and better printing quality has steadily fallen.

Micro nozzles

If those pinhole nozzles look tiny, they are. Typically they're only about 70um (microns) in diameter — 0.07 of a millimetre, or about the same diameter as a human hair. Yet a typical inkjet's printhead has between 200 and 1000 of them, distributed between the various inks. (There's usually rather more of them for the black ink than the coloured inks.)

All of those tiny holes must be very tightly controlled in terms of diameter and spacing, too, in order to achieve dot resolutions as high as 1400dpi (dots per inch). This means effective nozzle spacing of 80um or less, in multiple staggered rows.

To make this possible, the holes are made using much the same kind of production technology used to make ICs and other semiconductor devices. The metal is coated with photoresist material and then exposed to UV light through an optical mask, followed by development and chemical removal of the unexposed resist. Then the tiny areas of revealed metal are removed by plasma erosion or chemical etching, etc.

Finally the hardened photoresist is removed, to leave a 'nozzle plate' with its array of precisely dimensioned and spaced micro nozzles.

Ink modulation

Thanks to micromachining, then, we now have an array of tiny ink nozzles. The next step is to persuade the inks to emerge from them, in carefully controlled microscopic droplets. This is where the developments in ink modulation come to the fore.

In fact a number of different techniques have been developed to do this, but each of them have the same basic aim: generating tiny pressure waves in the liquid ink just behind each nozzle, so that a controlled quantity of ink is ejected from the nozzle to form a compact droplet which is almost perfectly spherical in shape, by the time it hits the paper.

It's an *HP ink jet printer, in case you're wondering...*

By the way we're talking here of *very* small drops of ink. Typically they contain less than 10pL (picolitres) of ink. A picolitre is a millionth of a millionth of a litre, or if you prefer a thousand-millionth of a millilitre.

Fig.1 shows the way these tiny droplets are made to emerge from the nozzles. Initially the ink liquid forms a curved 'meniscus' at the nozzle, held in place by surface tension. Then when the pressure wave inside the ink reaches the nozzle, the surface bulges outward, and finally a droplet breaks away and moves toward the paper. Just before it hits the paper, surface tension has moulded it into an almost spherical shape — so that it enters the paper surface and doesn't splash or diffuse outward very far.

In the printhead of a modern inkjet printer there are something like 12,000 of these droplets emerging from the nozzles each second, to allow the printer to produce a page image in no more than a minute or so.

By the way in many modern inkjets, droplets can be ejected from the nozzles at such a speed that up to four or more can be directed at the same pixel location on the paper, in rapid succession. This allows fine graduation of pixel density, by effectively synthesising variable-size ink drops using multiple fixed-size droplets.

It's also worth mentioning here that although most low-end colour inkjets use the standard CMYK system with its four subtractive ink colours — cyan (C), magenta (M), yellow (Y), and black (K) — some of the up-market models use *additional* inks with 'paler' versions of the same colours, to allow them to achieve a larger number of tonal and colour gradations. For example Canon's PhotoRealism models use a total of seven inks, the additions being light cyan (CL), light magenta (ML) and light yellow (YL).

Making waves

So the droplets are made to emerge from those micro nozzles by generating tiny pressure waves in the ink, just behind the nozzles themselves. But how's this done?

Well, as I hinted earlier, there are a number of techniques. However they broadly fall into two categories: the thermal approach, and the piezoelectric approach.

With the thermal approach, there's a small chamber behind each nozzle and in each chamber there's usually a tiny thick-film resistor, which acts as a heating element (Fig.2). When a droplet is required from that nozzle, a short pulse of relatively heavy current is passed through the resistor. This causes the resistor to heat up rapidly, and the heat is immediately absorbed by the ink that's in contact with it. As a result the ink vaporises, creating a tiny bubble of ink vapour; and the expanding bubble generates the pressure wave which causes an ink droplet to emerge from the nozzle.

Of course the bubble very soon cools and shrinks again, with the vapour condensing. This produces a second 'suction wave' in the ink — especially as a small amount of ink has been lost in the droplet. The drop in pressure results in a tiny amount of additional ink being drawn into the chamber from the main reservoir, replenishing it ready for producing the next droplet.

This thermal method of droplet generation is basically that used in the inkjet printers marketed by firms such as Canon and Hewlett-Packard. The alternative piezoelectric method is used by Epson, the third main manufacturer of inkjets.

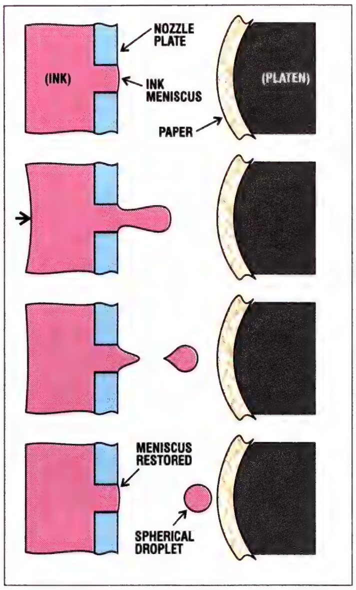


Fig.1: *How the ink is made to emerge in extremely tiny droplets from the printhead nozzles, in response to a pressure wave in the ink itself.*

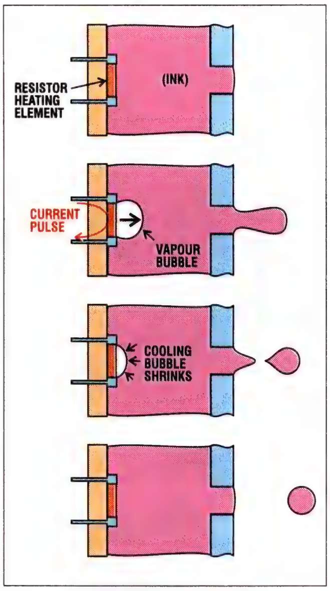


Fig.2: *In a thermal type printhead, a tiny resistive heating element is fed with a current pulse. This creates a short-lived bubble of ink to produce the ink pressure wave.*

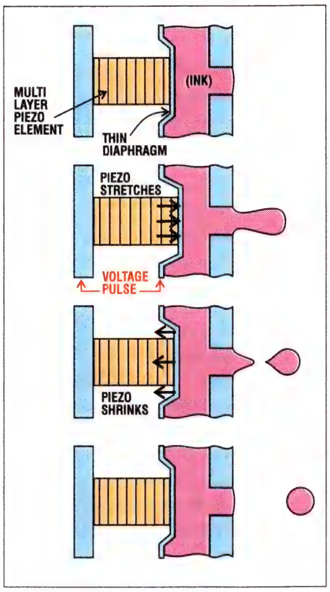


Fig.3: *The alternative approach uses a piezoelectric element, which is fed with a voltage pulse. This pushes in the metal diaphragm at the back of the ink chamber...*

With the piezoelectric approach, the rear of the ink chamber is essentially a very thin metal membrane or diaphragm (Fig.3). And immediately behind the diaphragm is one end of a small piece of multilayer piezoelectric ceramic material, with its other end in contact with the printhead body.

Like all piezoelectric materials, the ceramic element changes its shape when a voltage is applied across it. In this case when a voltage pulse (about 20V p-p) is applied to it, its length suddenly increases for a brief time, pushing the diaphragm forward and thus generating the pressure wave in the ink necessary to produce a droplet.

Again as soon as the pulse ends, the ceramic element shrinks back to its original length and the diaphragm returns too, producing the suction wave which draws in new ink.

So if you like, the construction of this type of printhead chamber is similar to that inside a crystal earphone or piezoelectric tweeter: we have a ceramic 'driver' coupled to an easily-vibrated metal diaphragm. The main difference is that here we use them to produce pulsed pressure-then-suction waves in the ink, rather than continuous sound waves in air.

There's a suggestion that this type of piezoelectric printhead is potentially capable of faster operation than the thermal type, because the time constants associated with piezo-produced movement tend to be shorter than those associated with heating and cooling. Perhaps the piezoelectric system might also be capable of easier control of droplet size as well, for the same reason. However the firms which specialise in thermal printheads seem to dispute these suggestions, and in practice neither type of inkjet printer seems to achieve dramatic performance advantages over the other. **ea**

DARREN YATES

In this last installment of Experimenting with Electronics, Darren Yates delves into the world of thermionic valves, how they work and how to make them work.

Valve Audio: An introduction

IN THE FIRST decade of the 20th century, man learned to do three things — he learned how to fly a 'heavier-than-air' aircraft, how to drive a car and how to amplify an alternating signal.

Now you could easily debate which of the three things was the most significant, however I don't think there's a shadow of doubt that the last one is the winner.

Thermionic valves, or just plain 'valves' or 'tubes' as they came to be known, really brought us out of the 'electrics' era and into the modern world of electronics.

Thomas Edison, of electric light fame, once noted a current flow between two electrodes inside one of his globes when one electrode was at a higher voltage than another.

In 1904, British Professor Sir John Fleming took this one step further and discovered the thermionic diode, the first valve that was able to rectify an alternating signal.

In 1906, American inventor Lee DeForest figured out that he could control the flow of electrons by inserting a third electrode into an evacuated glass envelope diode and throwing some negative volts on it. Whether or not DeForest actually knew how his 'Audion' worked has been debated by many, however one thing is clear — the early Audion, or 'Triode' as it became known, revolutionized the world of electrics and electronics was born.

Australia's own EA - or more correctly, its forerunner *Wireless Weekly* - was at the forefront of this new field of electronics starting from 1922, regularly giving updates on the world of radio as well as describing an ever increasing array of build-it-yourself radios and gramophone record players. I'm sure there are more than a few readers of this column who have built at least one *Radio & Hobbies* project over the years.

The Second World War saw valve development hit its peak but the beginning of the end dawned one day in 1948 inside Bell Laboratories when the transistor was invented.

From that day on, it was inevitably only a matter of time that names such as RCA, Telefunken, GEC, Mullard and Australia's own AWV (Amalgamated Wireless Valve) faded into the sunset as names from another time.

These five brands were arguably the most trusted and reliable of all valve vendors and even today audio valves from these companies fetch a handsome sum.

Mullard was the last of the big name valve vendors to shut its doors, doing so in 1988.

The Amalgamated Wireless Valve Company was one of the world's leading think-tanks as well as being a maker of fine valves, producing its world-renown monthly *Radiotronics* publication as well as the famed *Radiotron Designer's Handbook* by F. Langford-Smith.

This 1500-page tome became the industry bible covering all aspects of valve receiver and amplifiers from preamps through to transformers and loudspeaker design. In the last couple of years, this book has been reprinted by Butterworth-Heinemann and really is a must-read for anyone seriously thinking about understanding valve theory.

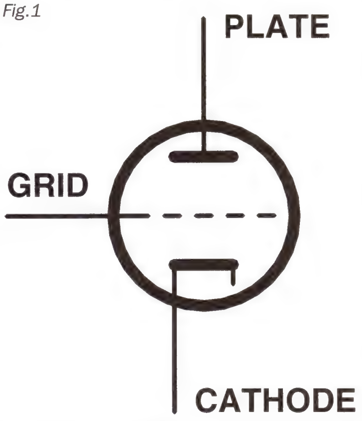
While many may regard valves as a study of history only, valves are still being produced around the world. A number of manufacturers in Russia, Asia and Eastern Europe continue to produce both transmitting and receiving valves and at quite reasonable prices too.

Triodes

Although arguably he didn't know it, Lee DeForest discovered the very first amplifying device, which he named the 'Audion'. However, for reasons of uniformity, the name 'triode' soon stuck.

A triode valve consists of three basic elements — an anode, nicknamed the 'plate', which is really what it is; a cathode, which is heated to produce a cloud of electrons, and finally a wire mesh wrapped around — but not touching — the cathode, called the 'grid' (See Fig.1). The triode was the forerunner to today's field-effect transistor and works in a similar way.

Fig.1

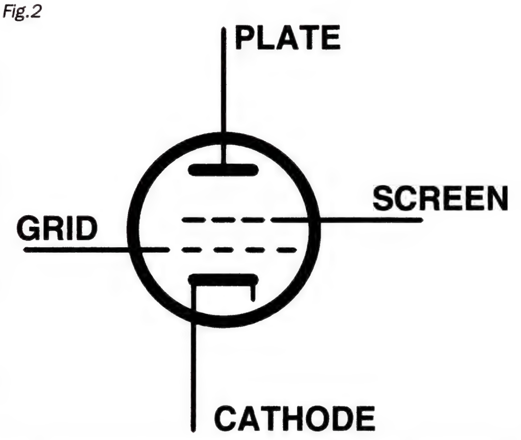


In all valves, the cathode is heated to a very high temperature — around 800°C. This high temperature allows some of the electrons on the cathode surface to break free and form a cloud around the cathode.

With the plate at a voltage more positive to the cathode, electrons flow from the cathode to the plate — which is basically what Sir John Fleming found, and was later called the diode.

However, if a voltage is applied to the grid that is negative with respect to the cathode, then the flow of electrons can be controlled. Varying this voltage

Fig.2



varies the cathode current flow. This was what DeForest found.

Triode valves were built in all shapes and sizes but by far the most famous (and now among the most valuable) is the 300B, first built by Western Electric, in 1935.

These valves were first used as the power output stage in audio amplifiers in movie theatres across the US and were made, as far as my research tells me, right through to the early-80s.

Western Electric was also the name behind many of Hollywood's movie sound recordings from the early 30s through to the 50s.

It's a sign of the rejuvenation of valve technology that Western Electric has begun making these famed valves again for a cool $US900 a pair. You can find out more about Western Electric at their Internet site **www.westernelectric.com**.

The 300B has a plate power dissipation of some 40 watts and is capable of producing 8 watts of Class-A audio — that might not sound like much but when connected up to quality hifi speakers, I'm told there's no sweeter sounding amplifier.

Transistors or Valves?

And that's part of the reason audio valves are coming back into vogue — more and more people are agreeing that valves sound better than transistors.

Now at this point, the transistor brigade will trudge out their superior signal-to-noise and total harmonic distortion figures as evidence of transistor's superiority over valves.

And if that's all there was to it, they'd be right — but I've read enough from more knowledgeable men than I over the last fifteen years to know that "one sunny day does not a summer make".

While much of the debate between 'hollow' and 'solid-state' comes down to a personal preference, there is some evidence to suggest why people's ears are saying valves are better. Valves are inherently far more linear than transistors in their operation and at low levels (more likely the levels you would listen to music in your lounge room), produce less distortion than transistors. This is something that famed engineer John Linsley Hood alludes to in his book *The Art of Linear Electronics*.

Another argument is that valves produce more second-harmonic distortion than transistors and less third-harmonic distortion — and it's It's this third-harmonic distortion that causes the problem.

But at the end of the day, while we can make measurements of speakers, amplifiers and signal sources, we don't know how to model the human ear.

Our ears also change over time — for example, the older we get, the less high frequencies we can hear. So if transistors sound better to you, great. If valves sound better, that's fine too.

It seems to me that we will learn far more about what really makes great audio by considering all the options.

And while it is clear many believe valves have a place in the story of audio, it makes sense to ensure that our knowledge of them, how they work and why should not be allowed to disappear.

Tetrodes

While triodes were great at audio, they did have limitations.

Firstly, the efficiency wasn't great — 40 watts in for 8 watts out isn't too efficient.

Secondly, triodes had limitations at higher frequencies because of the internal capacitance between the grid and plate. Triodes were also known to be unstable when used as RF amplifiers and transmitters and it was clear that something else was needed.

That 'something else' turned out to be a second grid called a 'screen' inserted between the grid and plate to reduce the grid-plate capacitance.

The screen is almost always connected to a voltage more positive than the cathode but less than or equal to the plate. Fig.2 shows the schematic symbol for a tetrode.

This screen grid also had a new effect on the operation of the valve — it was now the screen voltage, much more than the plate voltage, that controlled the amount of plate current.

However this screen grid caused a problem: if a tetrode was used to amplify a large signal, it was possible for the instantaneous plate voltage to drop below the screen grid.

This caused what was known as 'secondary emission' when electrons slamming into the plate would ricochet into the screen. This had the effect of reducing the plate current at higher loads and reduced the overall efficiency.

Pentode

The solution was the addition of a third grid between the screen and the plate. The schematic symbol and construction of this new device called a 'pentode' is shown in Fig.3.

This third grid, called a 'suppressor grid', was connected to the cathode and stopped this secondary emission.

Pentodes became the most efficient valves at turning electricity into audio power but it turned out that the downside to this increased efficiency was an increase in third harmonic distortion.

Despite that, there have been many notable audio pentodes produced and with good design, that harmonic content can be minimised.

These days, most audio purists turn their nose up at pure pentode power amplifiers but one area where pentodes have made their presence felt is in guitar amplifiers.

The English amplifier company Vox used four 6BQ5 pentode valves in its 30-watt AC-30 guitar amplifier, which may not mean much except that the AC-30 was the amplifier used by the Beatles during their early years.

The most famous pentode is arguably the EL34, used in hundreds of hi-fi and guitar amplifiers and introduced by Mullard in 1953 as a low-cost way of achieving 40 to 50 Watts. Again, EL34s are still being made today by a number of manufacturers.

Beam-power Tetrode

In an attempt to combine the lower distortion of triodes with the higher output power of pentodes, the suppressor grid was replaced with two electron-beam confining electrodes between the screen and the plate. This helped to further linearise the current flow, reducing distortion.

The beam plates (plus the distance between the internal electrodes) stopped secondary emission problems that plagued normal tetrode valves, giving designers high output power, high sensitivity (gain) and efficiency.

The first major beam-power tetrode was the 6L6 built by RCA in 1935, but there were two other famous beam-power tetrodes: the KT66 and KT88s produced by GEC in England.

In a recent article in an English electronics magazine, John Linsley-Hood recalled working as a student assistant for GEC in England during 1942 and seeing many KT66s glowing away in the test laboratory.

Both of these valves were used in many legendary audio amplifiers during the 1940s, 50s and 60s, appearing in everything from hi-fi to public address to guitar amps with 'attitood'.

While KT88 and 6L6 valves are still being manufactured in Russia and Eastern Europe, the original GEC-made versions of both the KT66 and KT88 fetch big money. Mullard continued to make KT66 and KT88 valves right up until it closed its doors in 1988.

Multi-valves

During WWII, the bulk of valves produced required what was known as an 'Octal' socket.

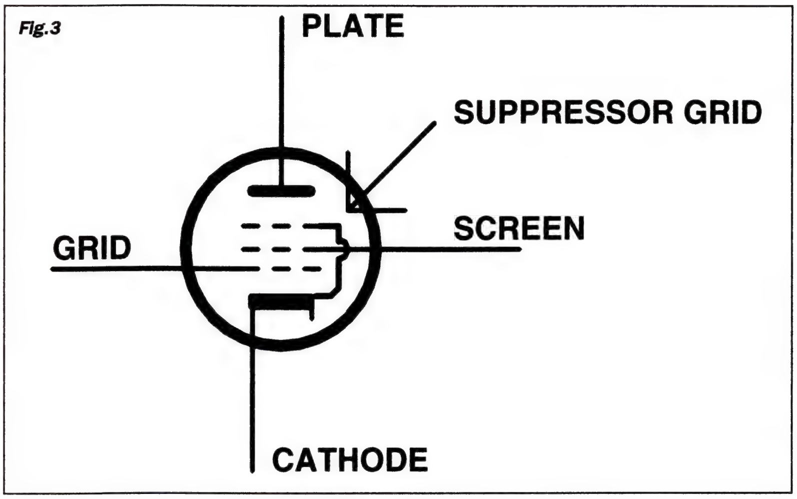
The internal structure of a valve comes out to a series of pins at one end, which fit into a socket. The back of the socket has solder lugs that allow you to wire up the other components. You can still buy octal sockets from both Dick Smith Electronics and Jaycar Electronics for around $5 each.

The main problem with the octal socket was that it was big and as the war required electronics to become miniaturised, the smaller 9-pin 'Noval' socket was created.

Having this many pins enabled designers to come out with 'multi-valves' or valves with more than one active unit inside. There were some notable octal 'multi-unit' valves including the 6SN7.

The most common noval multi-valves were dual triodes and the most famous of these are the 12AX7 and 12AU7 audio preamplifier valves.

Fig.3



These tiny valves contain two separate triode units inside and helped reduce the number of sockets and valves required in a circuit design.

Another common multi-valve was the triode-power pentode and the triode-power triode.

These units contained a small-signal triode with either a power-output pentode or triode.

Funnily enough, most of the triode-power triode valves were used as frame output stages in TV sets rather than audio amplifiers, mainly because the power triode was generally only rated to no more than 10 watts, which meant little more than three watts of audio.

The triode-power pentode was used in many TV sets and small hi-fi power amplifiers - the two most common are 6BM8 and 6GW8 valves.

6BM8 valves could do double work as either frame output stages in TV sets or as audio amplifiers while 6GW8s were audio amplifier valves only. While 6GW8s are no longer made, 6BM8s are still being made in Russia today.

Both of these types were used in many EA 'Playmaster' amplifier kits during the 1960s, producing between 8 and 13 watts RMS per channel.

Name that valve

Valves grew up in an era where the term 'global communications' had yet to be invented and in the end, there were several naming conventions worldwide. The two that have stood the test of time are the US JEDEC and the Mullard systems.

There were many valves that in the end were known under two different names: the Mullard-built EL34 pentode was known as a 6CA7 in the US, the 12AX7 dual-triode preamp valve was known as an ECC83 is Europe, and so on.

While it might seem there is little rhyme or reason in valve nomenclature, there actually was.

US naming convention

The JEDEC format was generally a number, followed by two letters and then a second number. The first number referred approximately to the heater or filament voltage.

'1' — 0 to 1.6 volts
'3' — 2.6 to 3.6 volts

'5' — 4.6 to 5.6 volts
'6' — 5.6 to 6.6 volts
'12' — 11.6 to 12.6 volts, etc.

The number '7' was given exclusively to special 'Locktal' valves.

These valves were used during WWII in aircraft receivers and transmitters and were built with a locking pin in the centre, the locking pin preventing the valves from vibrating out of their sockets, which B17s and Lancaster bombers were quite capable of doing.

Next, the two letters usually referred to the family from which the valves belong.

Rectifier diodes using started from 'Z' while triodes, pentodes etc started from 'A'.

F. Langford-Smith in his 'Radiotron Designer's Handbook' states that when all the single letters of a group were used, they proceeded with two letter domains e.g. 'AB'.

The only difference to this was that the letters 'I' and 'O' were not used to ensure they weren't confused with '1' and '0'. The letter 'S' was used in a special way.

Initially, a number of popular early valves had what was known as a 'top cap'. Instead of all the pins of the valve coming out of the bottom, the plate would come out to the top of the valve via a metal knob, to which a special cap was connected not too dissimilarly to a spark-plug lead. Later, some of these valves were redesigned as 'single-ended' valves, i.e., all electrodes came out only at one end. The 6SN7 valve for example was a single-ended version of the 6N7 dual triode.

Finally, the last number was said to be the number of active elements inside the glass envelope. A single triode ended in a '4' as did full-wave rectifiers while a Pentode completed its naming with a '5'. Dual triodes were '7' while triode-pentodes were '8'.

So a 6BM8 was recognised as a triode-pentode with a 6.3V heater voltage requirement.

However, you couldn't just look at the valve name and know exactly what it was, so while the JEDEC naming system worked, it wasn't perfect.

Mullard naming convention

The Mullard system was similar in its approach but more methodical. It began with a series of letters followed by two numbers, as shown in Fig.4.

The first letter referred to the heater voltage requirement. Those with series heaters were designed to be wired in series with other valves in a string. They had specifically-timed turn-on times to ensure none of the valves in the string received more than its required heater voltage.

The second letter referred to what was inside the valve glass while the first of the last two numbers referred to the socket type.The second number was used to differentiate between similar types.

For example, EL84 and EL86 valves were both 6.3V-heater (E) output pentodes (L) Noval-socketed (8) types, the main difference between the two is that the EL86 has a lower plate resistance than the EL84 and is also useable as a frame output valve in TV sets.

An ECC83 valve is a 6.3V-heater (E), double signal triode (CC), noval-socketed (8) type. The difference between the ECC81, ECC82 and ECC83 are that the ECC81 is designed primarily for RF applications, the ECC82 is an audio driver valve and the ECC83 a small-signal light-duty preamp valve.

This didn't stop designers using the ECC81 for audio applications though.

As a further note to the serial heating type valves, one example of these was the European version of the 6BM8 known as the ECL82. There was also a PCL82 and a UCL82. They were identical to each other except for their heating requirements.

Valves do have sentimental value to many readers. They bring back memories for many of elder generations and they are a link to our recent history for a few younger ones (including yours truly) but in their own right, valves have much to offer when it comes to the science of truly 'high-fidelity' amplifier design. ea

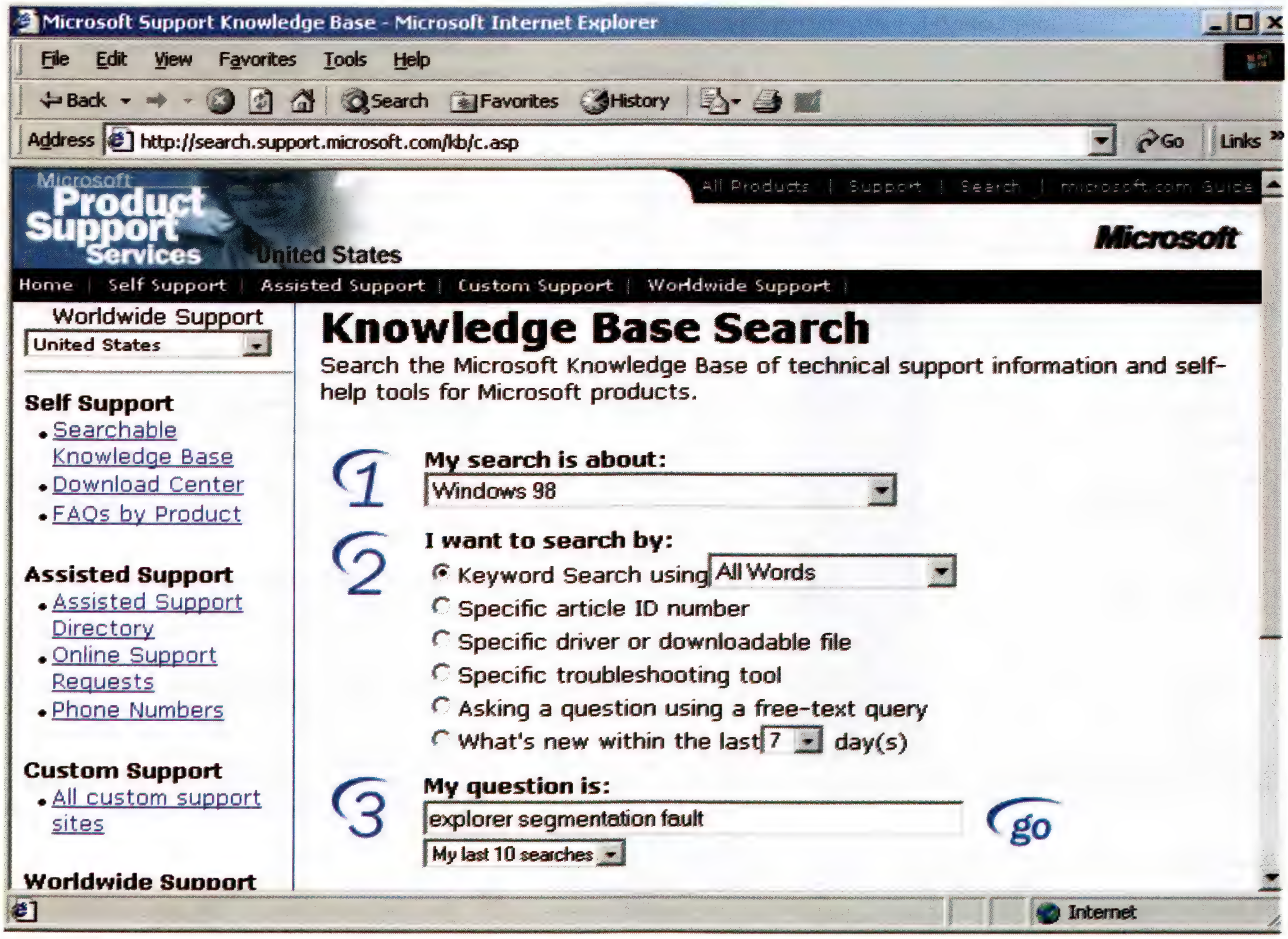
Fig.4 *Mullard naming convention*

1ST LETTER: HEATER VOLTAGE	2ND (OR 3RD) LETTER: VALVE TYPE	1ST NUMBER: SOCKET TYPE
A = 4 V	A = single low level diode	0,1 - miscellaneous
B = 180 mA series-heater	B = double low level diode	2 - Loctal
C = 200 mA series-heater	C = small-signal triode	3 - Octal
D = 1.4 V	D = power triode	4 - B8A socket configuration
E = 6.3 V	E = small-signal tetrode	5 - B9G, B9D (Noval socket arrangements)
F = 12.6V	F = small-signal pentode	8 - B9A (Noval socket arrangement)
G = 5 V	H = heptode/hexode	9 - B7G (seven-pin socket)
H = 150 mA series-heater	K = octode	
L = 450 mA series-heater	L = power tetrode or pentode	
P = 300 mA series-heater	M = tuning indicator	
U = 100 mA series-heater	W = gas filled single rectifier diode	
V = 50 mA series-heater	X = gas filled double rectifier diode	
X = 600 mA series-heater	Y = power diode	
Y = 450 mA series-heater	Z = full-wave rectifier	
Z = cold cathode		

BY JEAN BAPTISTE CATTLEY

The ten tricks of the trade, and some CD Software

A fair few people have asked me over the years how I knew all the obscure little details relating to their particular problems. Much as I'd like to be thought omniscient, I think it's time to pass on some of the tricks of the trade...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Address http://search.support.microsoft.com/kb/c.asp
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My last 10 searches
Internet

Knowledge Base Search

Search the Microsoft Knowledge Base of technical support information and self-help tools for Microsoft products.

1 My search is about: Windows 98

2 I want to search by:
- ● Keyword Search using All Words
- ○ Specific article ID number
- ○ Specific driver or downloadable file
- ○ Specific troubleshooting tool
- ○ Asking a question using a free-text query
- ○ What's new within the last 7 day(s)

3 My question is: explorer segmentation fault

Microsoft's 'famous' Knowledge Base. *Along with every Windows bug they'd like to admit to, there's a wealth of troubleshooting tips, documentation and common support issues.*

1 First up, use the Net! There's nothing in the world (and certainly nothing computer-related) that isn't covered on the web somewhere. If something has you stumped, go to your favourite search engine, and start searching. But first, a word on searching the web — this may sound obvious to most of you, but

Leave out the 'little' words, such as 'but', 'the', 'and', etc. Search engines filter most of these anyway, and you'll just wear out your fingers typing them. Remember, you only want to specify the keywords that link a web page to your specific query.

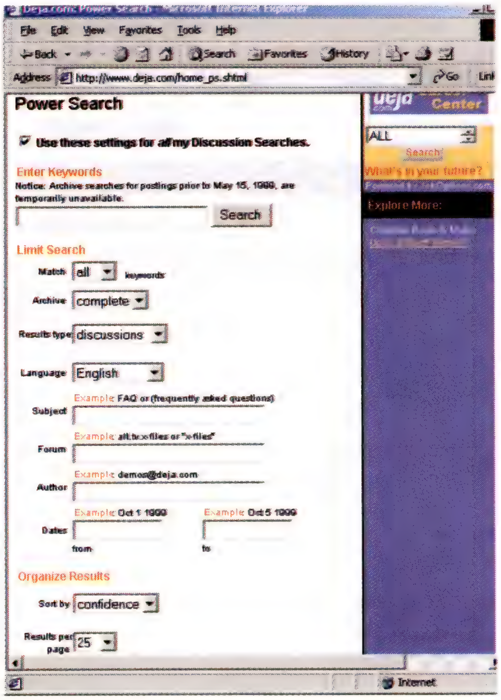
Try to pin down the concept you're searching for in no more than three or four words — if you need more than that, you should probably rephrase it. Just imagine looking something up in a printed index; you wouldn't look *anything* up under 'W' for 'Want to...'

2 Use a decent search engine. In practice, this means using Google (**www.google.com**), the single best search engine on the net. Google consistently delivers the most relevant search results, does a fine job of filtering out the rubbish, and it's just about the only engine I ever use. All keywords are strictly ANDed, so you don't need to append a '+' to each word. (As you do on Altavista if you want less than seventy billion results.) They also have a human-edited web directory at **http://directory.google.com** that leaves Yahoo just standing there cold.

If your problem is so obscure that you can't get *any* relevant hits, then try Altavista (**www.altavista.com**), but be warned, you'll get a million hits that bear little or no relation to your search terms.

3 If a straight web search doesn't help, there's a few other avenues to explore. If you need Windows-related information, Microsoft's KnowledgeBase is a good place to start.

With every acknowledged Windows bug (think about it...), the most common customer support issues, troubleshooters, and huge quantities of raw documentation, the KB is an invaluable way to track down the info you need. Head on over to **http://search.support.microsoft.com/kb/c.asp** and have a go.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Search
What's in your future?
Explore More:
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Power Search

☑ **Use these settings for *all* my Discussion Searches.**

Enter Keywords

Notice: Archive searches for postings prior to May 15, 1999, are temporarily unavailable.

Search

Limit Search

Match: all keywords

Archive: complete

Results type: discussions

Language: English

Subject: Example: FAQ or (frequently asked questions)

Forum: Example: alt.tv.x-files or "x-files"

Author: Example: demon@deja.com

Dates: from Example: Oct 1 1999 to Example: Oct 5 1999

Organize Results

Sort by: confidence

Results per page: 25

Deja.com *indexes all of USEnet - a huge resource of internet newsgroup archives. If you have a computer problem, chances are someone has discussed on USEnet.*

4 Use USEnet. For those not in the know, USEnet is Internet News, a decentralised topical message board that's about as old and as big as the Internet itself. With literally tens of thousands of newsgroups, and millions of users worldwide, you're pretty much guaranteed that someone else out there knows how to fix your problem, and you're likely as not to walk right in on a conversation that nails it flat.

If your ISP doesn't have a worthwhile news server (so few do, these days — USEnet got left behind somewhat in the amazing popularity surge of the Web itself), try Microsoft's own news server, msnews.microsoft.com. Just visit **news://msnews.microsoft.com/microsoft.public.win98.gen_discussion** to get you started, and browse the available news groups — you won't be disappointed.

Deja.com (the website formerly known as DejaNews, before the marketing types got to it) is an amazing resource — it archives and indexes the whole of USEnet — a gargantuan task by anyone's standards. If anyone's discussed it on USEnet in the past, you can find it on deja.com. It might not lead straight to a perfect fix, but it can certainly get you started. **www.deja.com/home_ps.shtml** is the place to start.

5 If you need immediate, one-on-one help, why not try IRC? Internet Relay Chat is a protocol for exchanging text messages between all users on the system, in realtime. Broken up into topical 'channels', it's the perfect way to find real experts, and get personalised help within seconds. Get yourself a copy of mIRC ($20 shareware, from **www.mirc.com**, and the best value for money software you'll ever see), connect to an IRC network such as Undernet, DALnet, or Efnet, and join a tech-support channel.

Be aware of the channel rules, (ask a channel operator) and listen more than you speak, and you're set. While I'm on the subject, I'd like to personally thank some of the good friends on IRC who have helped me over the years: Jster, Jewels, truant, OlifaNT, [Omega], ariela`, Tre, puppet, Nimbus, Brainmast, Izh, DW and Calypso to name but a few — keep it up, I could never have done it without you.

6 Look on shareware sites to find utilities to work around the problem — try **www.davecentral.com**, **www.tucows.com**, and **www.nonags.com** — these should be enough to get you started. When in doubt, try the free programs first — they're usually just as good, if not better.

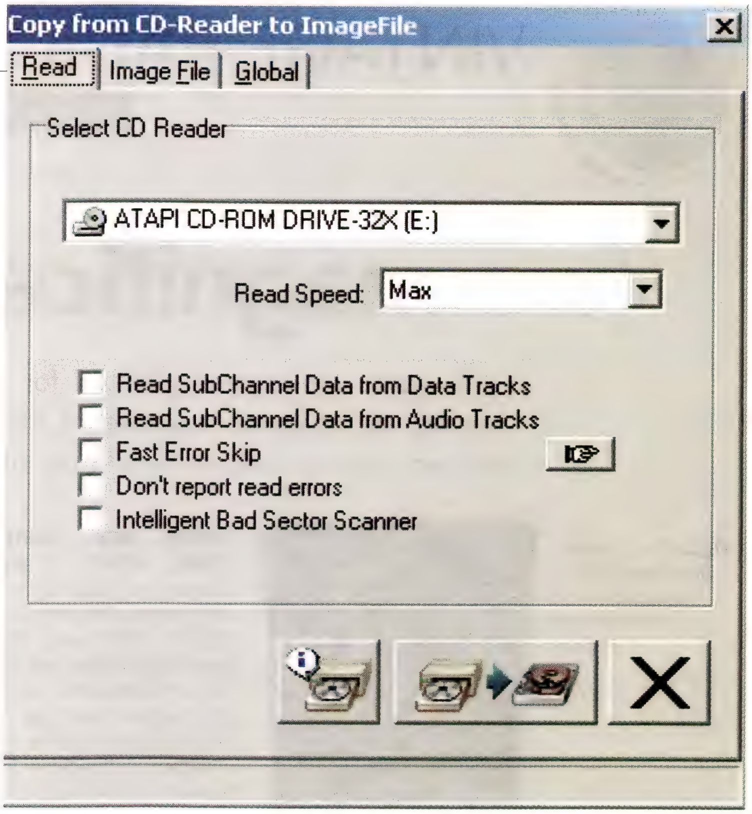
7 Learn a programming language! Write your own utilities! It really is easy, and a little work invested in learning a language will pay off hugely — you can finally automate those tedious little tasks, and have a lot of fun doing it. What's more, while digging up the necessary bits of documentation for one task, you'll learn one hell of a lot about your whole system, making everything a lot easier for next time.

I'm completely biased, of course, but my favourite language is still Perl (**www.perl.org**) — insanely powerful, quirky, and completely free. For more Windows-based programming, keep an eye out for demo/free versions of languages like Delphi, Visual Basic and C++ Builder — they're a lot of fun once you get started, and well worth a go.

8 If you're still stumped, fool around and see if you can fix it by accident! Load up Regedit, and search for related keywords, and try changing things. Yes, it's dangerous if you're not careful, but if you make backups first, the worst that can happen is that you need to reload. Poke around in your windows directory, find out what various obscure little programs are for, try to break things, get a feel for the inner workings of your OS — you may not end up fixing your original problem, but you'll probably fix three others you never knew you had.

9 Try a different operating system! You never know, you may even give up on Windows altogether and immerse yourself in the Way of the Penguin - linux is much, much more stable, interesting and useful than windows will ever be. It's not so convenient as a desktop OS, but once you get the hang of linux, your windows problems will fade away like a half-forgotten dream. (or be so trivial in comparison that you won't care...)

10 Above all, have fun, get your hands dirty, play with undocumented features, track down the weird little bugs you encounter — you'll never fix anything by being too careful. So you make a complete mess of your system — reinstall, and work out what went wrong. This is what makes computing fun! Good luck!



Select CD Reader

ATAPI CD-ROM DRIVE-32X (E:)

Read Speed: Max

☐ Read SubChannel Data from Data Tracks
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***CloneCD** is a no-frills CD burner package that can force your writer to directly copy CDs, without interpreting the data.*

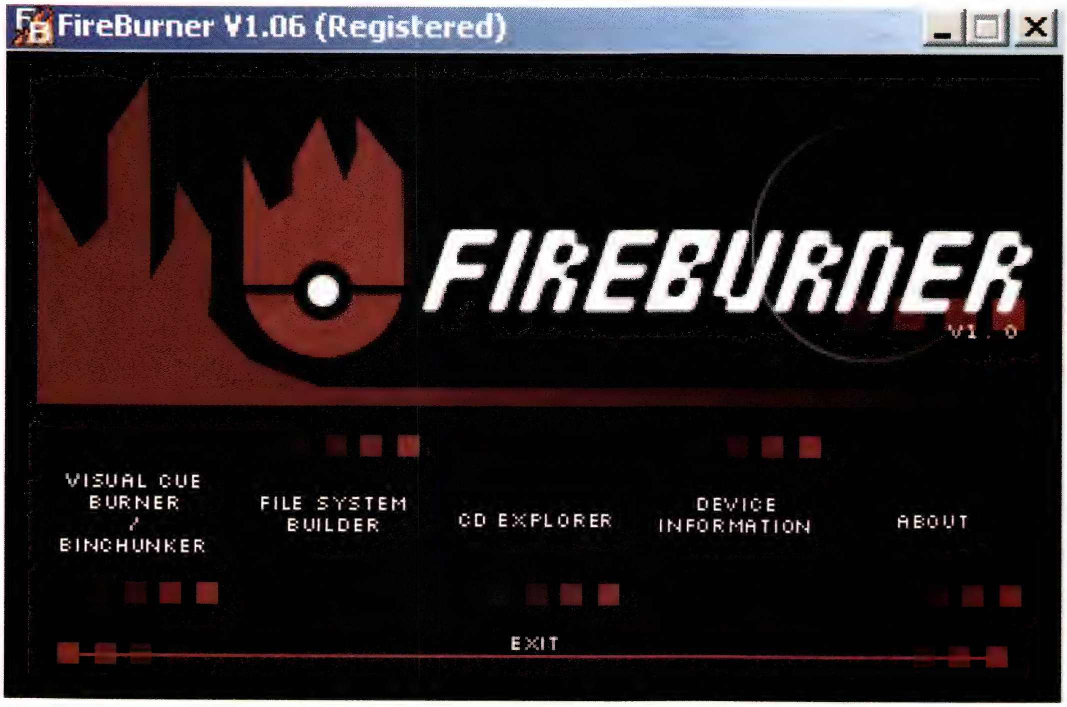
CD software

I recently acquired a second-hand CD burner at a swap meet, but it didn't come with any instructions or software. I've managed to install it in my computer, and windows sees it as a CD-ROM drive — but how do I actually burn my own CDs? (Ian Andover, by email)

Probably your best bet would be to head over to **www.adaptec.com**, and get Easy CD Creator 4 Deluxe. It does pretty much everything you could ever want — create or clone your own CD-ROMs, audio CDs, bootable CDs, audio CDs from MP3s, self-running 'video postcards' from image collections, and comes with a host of software including a jewel case insert designer, video, photo and audio editing software, one-step backup and restore, VCD creation, CD-i support (remember them?) CD-RW support (this is cool, it works just like a rather slow hard drive, only removable) — they even throw in a CD-labeller and labels to go with it! For $US79, it's an extremely good deal indeed and highly recommended.

Of course, if your budget doesn't quite stretch that far, you might like to try a couple of other burners out there. One such is FireBurner, from **www.fireburner.com**. This flashy little app basically creates data or audio CDs from a directory of data or audio files. No frills, no bloat, it just works. It's $US35 shareware, and if that's all you need, it does the job very nicely.

If you just want to copy CDs, get yourself a copy of CloneCD, from **www.elby.de/CloneCD/english**. This no-frills burning app is designed to copy any CD you can throw at it — even copy-protected ones. It does this by kicking your burner into 'raw' mode, and passing the data from the source CD untranslated. Only some burners support this feature (check the web page to see if yours will work), but if not, it will fall back to standard mode. Small, simple, effective. Not hugely cheap at $US50, but it can backup discs that no other program can. **ea**



***With a** shareware registration fee of just $US35, Fireburner has to be about the cheapest way to get hold of a decent burner program.*

BY ROGER JOHNSON

Two magnificent consoles

While some radios are collected for their technical refinements, probably the majority are collected because of their visual appeal. The two console radios featured this month fit well and truly into this category.

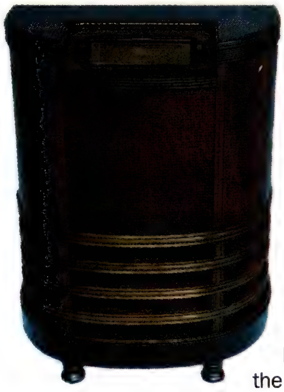


Fig.1: *The eloquent Stromberg Carlson model 781, in its semi-eliptical console.*

THERE ARE SOME radios which simply scream out for the correct setting. The Kreisler 710 of 1937 and the Stromberg Carlson model 781 of 1938 simply conjure images of standing in the sitting room corner of a Californian bungalow in the leafy eastern suburbs, a moquette club lounge suite, and a new Buick or Dodge motor car parked in the neatly raked gravel drive. The Stromberg Carlson in particular is without a doubt one for the 'deco freaks'.

The Stromberg Carlson

The completed and restored radio now looks every bit as enticing as the images described above. The solidly built cabinet is semi-elliptical in plan (i.e., looking from above) and has a stratiform speaker grille, which is offset by the black plinth at the base of the cabinet and black trim on the top. The accommodating dial has a central magic eye tuning indicator, and the edge-operated controls are tuning on the right, and split volume and tone on the left.

Sitting below the dial are a series of 10 self-cancelling pushbuttons. Eight are pre-set station selectors, while the other two are for selecting short wave and manual tuning.

Some rather unkind Philistine has dubbed this radio model the 'Dalek', after the android characters from the TV series *Dr Who*. However a Dalek would *never* have such class!

When this radio was found it was in a very sorry state indeed. It was covered in dust inside and out, and was rumoured to have hailed from Broken Hill. Judging by the call signs in the station selectors, this may well have been true.

One leg was missing altogether, another had been replaced with a block of wood, and another was split. The one remaining 'good leg' served as a pattern for a

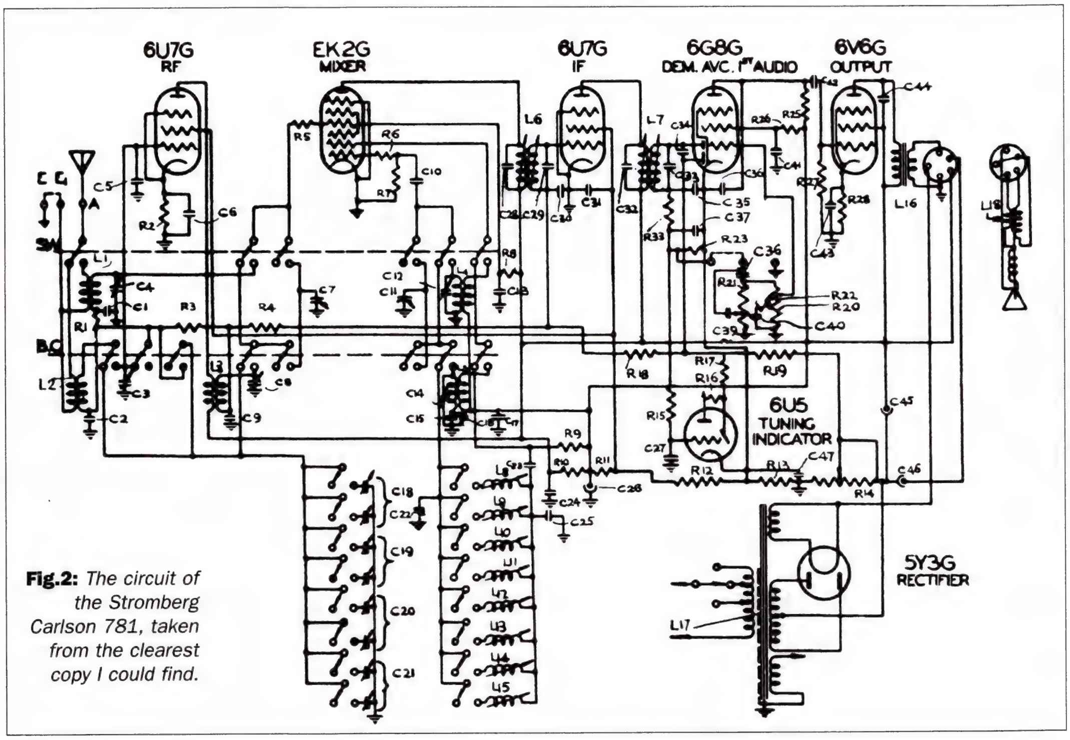


Fig.2: *The circuit of the Stromberg Carlson 781, taken from the clearest copy I could find.*

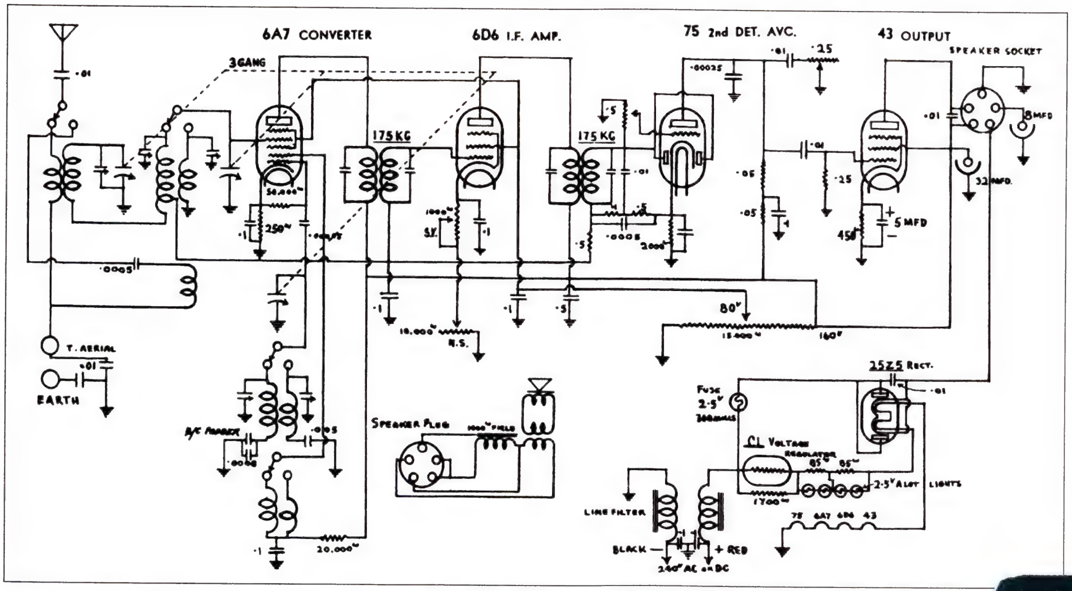


Fig.5: *The circuit for Kriesler models 830-833, the closest I've been able to find to that actually used in the 710.*

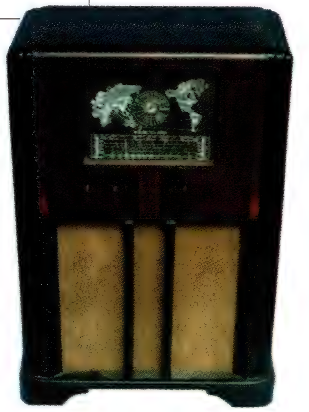


Fig.3: *The cabinet of the Kriesler 710, a 1937 model famous for its elaborate dial.*

wood turner. However the dial was complete and by some miracle, none of the cabinet veneers had lifted. After a painstaking cabinet restoration, it was time to turn to the chassis.

The chassis

The rather cramped and blobby circuit (the best I could find) is shown in Fig.2, and suggests what's in the chassis. The basic pushbutton arrangement can be seen, but the actual wiring is a far cry from the simplified circuit. Each of the pushbuttons activates a spring loaded cancellation bar, which in turn operates a set of 10 axially arranged switch banks. The bare wiring from one to the other is extremely complex, and would be well-nigh impossible to trace and correct in the unfortunate event that it had been tampered with.

Indeed, in the chassis of my set there was evidence of soldering and a replacement capacitor of some sort that looked for all the world like a 'ring in'. Those perceived alterations did not auger well. The mechanism was stiff and none too free.

Copious amounts of 'WD 40' lubricant spray were applied to all the mechanical parts and the buttons were serially pressed for a very long time until the whole mechanism was working freely and with minimum pressure. So far, so good.

After the usual checks and replacement of all faulty components, checking the wiring under the chassis, and finding a modern replacement speaker for the 10" speaker which had an open circuited 1500-ohm field coil, it was time to bench test it.

By another miracle the switching, if it had been tampered with, was working satisfactorily, and there were semblances of shortwave reception. The pushbutton tuning and manual tuning both seemed to be working too, despite being in need of a good alignment.

The Circuit.

As you can see from Fig.2 this is quite interesting. A quick glance shows an RF amplifier, thereby giving the expectation of good results. However when we trace the circuit through, we see that the RF amplifier is only switched in for the broadcast band manual tuning function.

The two switches with dashed lines to the right and designated 'SW' and 'BC' represent the pushbutton selectors for those two bands respectively, in which manual tuning is functional. In the circuit, the broadcast band is shown connected, but with the pushbuttons in circuit.

If you follow the first 'BC' contacts (i.e., the wipers and contacts as shown), you see the top of the tuning coil then connected to a series of pairs of trimmers (C18 to C21). These trimmers, which tune the aerial coil L2, then connect via the fourth 'BC' contacts and the second set of 'SW' contacts to the grid of the EK2-G mixer. The RF amplifier is not used. At the same time, though, the AGC is connected to the 6U7-G grid despite there being no signal input.

If the 'BC' manual option is selected by pressing the B/C pushbutton, the wipers of the 'BC' switch now swing over to the right hand contacts. This connects gang section C3 and trimmer C5 (at the 6U7 grid) in circuit, and the RF coil L3 is tuned by C8 and gang section C7 via the third and fourth con-

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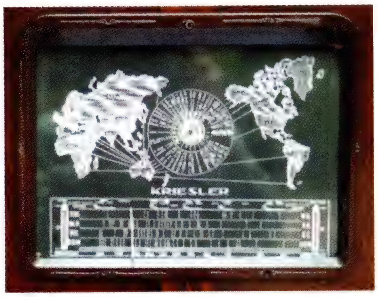

Fig.4: *Here's a closeup of the 710's impressive 'Map of the World' dial glass, with its universal time indicator and tell-tales for volume and tone.*

tacts of the 'BC' switch and the second set of contacts of the 'SW' bank.

If short waves are selected (from any given pushbutton option), all other pushbutton connections are cancelled, and the wipers of the 'SW' switch sections are moved over to the right-hand contacts. It becomes pretty clear that the shortwave coil goes direct to the EK2-G grid, being tuned by gang section C7 and trimmer C4. Again AGC is applied to the 6U7-G grid, despite it having no signal input.

As for the oscillator section, if the pushbutton tuning option is selected as shown, we see that coils L8 to L15 are slug tuned Colpitts oscillators. When manual tuning is selected, gang section C11 and trimmer C14 are switched in and tune L5. (The circuit is very difficult to follow because of its very poor quality draughting and printing.) The circuit has several mistakes in component parts corresponding to the parts list.

'Acoustic Labyrinth'

The 781 was one of several 1937/8 Stromberg Carlson sets featuring their much publicised 'Acoustic Labyrinth'. This is a labyrinth box placed behind the speaker, which in theory extends the audio path for radiation coming from behind the speaker and hence improves the bass response.

Had the box been completely sealed and contained one or two more paths to extend the wavelength, it might have made some improvement. As it is, it seems to make not one iota of difference, and has been retained merely for the sake of completion. So fear not, you Stromby collectors who have a missing labyrinth — you're not missing a thing!

In fairness, though, this particular radio has a replacement speaker *circa* 1948. This is a permag type, and the choke and voltage dropping resistor have been mounted on the baffle board so that the speaker plug can still be used and there is no alteration to either the chassis or the wiring. However the observation still remains that there is no difference in sound at all between the labyrinth being in place and not.

Performance

As for performance, the set can best be described as 'adequate'. There is plenty of oomph on the broadcast band, and when manually tuned, the regional stations can be heard. But as for shortwave, it is only typical and nothing startling.

This particular radio does have one very annoying habit, though: drift. When the pushbuttons are selected, the selected stations are off-tune in about a half an hour.

Just why is difficult to understand. The most obvious course of action is to replace the mixer valve. Another possible, but unlikely scenario, would be the rise in temperature (perhaps only a degree) as a result of the valves generating heat. Perhaps this causes minute expansion in the chassis and the physical dimensions of the oscillator coils, thereby causing a change in frequency. However one can't imagine this radio being offered to the public with such an annoying habit. Perhaps it is time to look for a new valve!

Just why the RF stage is switched out for shortwaves is also a mystery. It would require only one set of coils and two extra switch contacts, and the performance would be considerably better. However not wanting another eight sets of switch contacts for switching RF coils on the broadcast band is understandable.

The Kriesler 710

There is no doubt that a radio with a broken or missing dial glass is significantly reduced in value, and there could be nothing more devastating than to have this happen with a Kriesler 710 'Map of the World' set (Fig.3), because here the dial glass is absolutely one of a kind and quite rare. In fact the dial glass almost IS the radio, as can be seen from the closeup in Fig.4. This is notwithstanding the handsome cabinet of pleasing proportions and veneers — and again, black striping and trim (and dust!).

There is no known circuit for this radio, despite the numbers '710' being quite clearly stencilled on the chassis. The circuit is significantly different from that published for the 710A, and can only be guessed at. The front end very closely resembles the models 830-833 which were published in the Radio Trade Annuals and the *Australian Official Radio Service Manual* for 1938. The circuit shown in Fig.5 is for an AC/DC version, and there seems to be nothing in a normal 240V AC version that matches the front end.

Be that as it may, careful examination of the chassis showed that the coils and switching arrangements are as in Fig.5, apart from the DC isolation capacitors used in the AC/DC model.

What is unusual is that this circuit offers short wave reception with a 175kHz IF — and although there's a pre-selector coil for the broadcast band, there isn't for short waves.

Of course putting in pre-selector coils for short waves is not without difficulties, in getting them to properly track. But with a 175kHz IF and without a pre-selector or RF stage the set was almost bound to have the image frequency or 'double spotting' problem. (I can almost hear the salesman: "Madam, you get twice as many stations for your money", or "...Sir, this radio is so good it tunes the short waves twice!"

The Kriesler chassis has four controls, the normal four plus a sensitivity control in the cathode of the 6D6 IF amp. The circuit actually shows two pots in series, as you can see: one marked 'NS' (presumably for 'noise suppressor') and the other 'SV' for sensitivity volume. Just why two controls are used in this position is a bit of a mystery. Was the second control a chassis control or a panel control? There is in fact only one on the 710.

As for performance, the 710 delivers about what one would expect from 1937 coils and a 6A7 converter — these were not renowned for their shortwave performance. Notice that AGC is not used on shortwaves because of the propensity of the 6A7 to 'pull' or drift off station. With the coils that were used, the daytime reception is about as good as you can get.

In 1937, though, shortwave reception was a fairly new innovation for domestic radios. It had only been a feature for two or three years at most until then, and was a strong selling point.

(Continued on page 97)

INFORMATION CENTRE

BY PETER PHILLIPS

Olympic flame problem explained, **reader questions** and changes

This month, we look at just what happened at the Olympics Opening Ceremony and explain what happened to cause the flame ceremony to be delayed. Following are our usual reader letters covering topics like using standard AA batteries in place of a computer CMOS back-up battery, how to charge batteries devoted to a car audio system and other questions related to projects or electronics.

IN LAST MONTH'S column, Shaun O'Brien (Gold Coast, Qld) asked about the Olympic flame problem. What went wrong? Would Australian engineers be seen as being incompetent by a viewing audience of billions? The following information comes from the October issue of the trade magazine *Connections*, which gives a very good coverage not only about the 'flame problem', but about the entire event.

And, according to *Connections*, what a technical achievement it all was. But first the flame. It appears that a total disaster was very close, as unbeknownst to virtually everyone at the time, the mother flame and its backup had gone missing, presumed stolen. So if the cauldron had really gone out...

After the cauldron had been lit by Cathy Freeman, it should have started its journey up the slide, but as *Connections* explains: *"fully lit and fast burning a lot of bottled gas and hydrogen on board, the cauldron stalled at the cart when a limit switch malfunctioned."* Yes, a miserable limit switch! When it failed, engineers had to confirm whether the switch was the problem, or whether it was signalling an error condition. In the meantime, Cathy Freeman was told of the problem via in-ear monitors, and instructed on what to do and how to look.

As well, the soundtrack kept going, along with inbuilt timecodes which triggered the fireworks, causing them to go off before the flame sequence had been completed. Finally, the engineers determined that the problem was a switch failure, and manually restarted the process. Some crew members maintain that the cauldron was running out of gas, and was actually failing as it was connected to the gas mains after finally coming to rest.

So I guess this highlights the vulnerability of complex systems. But it also shows just how on top of it all the engineers really were. And given that this was the only visible problem in a huge line-up of technical achievements, I doubt the likelihood of Australian engineers being regarded as incompetent. Quite the reverse in fact.

For example, all video and audio signals were transmitted in digital form via fibre optic cables to a broadcasting centre a kilometre away from the Games venue. This is apparently the first time a show of this scale had been cabled in digital. Incidentally, the sound broadcast was both live and pre-recorded, depending on which sound source was the best at the time. When the Sydney Symphony Orchestra played however, the sound was pre-recorded.

The lighting was also a tour de force. According to *Connections* however, the supply voltage at the venue was an alarming 258V, causing lights to fail. The problem was finally fixed by changing taps on supply transformers, but not before quite a bit of damage had occurred.

Another major difficulty was assigning frequencies to the many radio microphones and in-ear monitors. At one stage, a bureaucratic bungle caused the loss of some 40 channels, but somehow the show went on. An issue also was the difference in height between Michael Knight and Juan Antonio Samaranch. To accommodate this at the lectern, a linear motor was used to raise and lower the microphone, with the motor activated by a crew member.

There's a lot more of course, and I recommend reading the *Connections* article about the games and

the technical triumphs that were achieved. We certainly have nothing to be ashamed about. But it could all have been killed by a lousy limit switch.

AA cells as a PC CMOS battery

In the Circuit and Design Ideas (CDI) in the August 1999 issue, page 55, there's a description of how to use standard AA size cells in place of the CMOS battery in a computer. However, the CMOS battery mentioned in the article is given two type numbers: 804 and 840. Which one is correct? (Ron, email)

The ideas presented in our CDI section (page 55, in this case) are sent in by readers, so it's difficult to say what the battery type really was. However, by the law of averages it's probably the 804, since this is mentioned twice — so there's probably a typo regarding the 840.

In any case what's important is the type of battery in *your* computer. PC backup batteries come in a huge range of formats, so you need to check its voltage before going any further. However, if the voltage is divisible by 1.5, then you can certainly use AA batteries. I've done this quite a few times (without the 100 ohm resistor incidentally), as sourcing a correct replacement is sometimes a hassle.

I want my Dolby

I am looking to build my own amplifier with a Dolby Digital 5.1 decoder. I was wondering if this is possible, because so far I haven't been able to find a kit that will do the job. (Reilly Smethurst, email)

Sorry Reilly, but all Dolby decoders require chips licenced from Dolby, so you aren't going to find these readily available. Having said that, there was a Dolby decoder kit sold through Jaycar stores. While they aren't a catalog item any more, it might be worth checking, in case they still have some in stock.

Car audio batteries

I'm installing a car stereo system comprising a fairly large amp to drive two subwoofers. I have a couple of 38 amp-hour 12V sealed lead acid (SLA) batteries that I want to run the amplifier with. This way I won't run down the car battery and it will give a solid power source near the amplifier.

The problem is that I need the SLAs separate from the main battery so if they run out I can still start the car. But at the same time I want them charged from the alternator. Any ideas on how I can do this? I have a good understanding of electronics and read your magazine often. Dick Smith sells a kit to run an auxiliary battery for a 4WD using MOSFETs. Would this work? (Michael Gormack, email)

Yes Michael, the Jan/Feb 1996 Battery Controller project should work in this case, but it may need modifying so it can deal with two SLA batteries, as it was designed for one battery to be charged at a moderate rate. However if you have a suitable alternator, there's another simple and effective way to do this with a single relay.

Some, but not all alternators have an external lug that's connected to the centre of the windings. This output is the centre point of the Y-connected alternator windings and will only output a voltage when the alternator is up to speed. It is typically used to run an electric choke, warning light, or other bits and pieces, and is a rectified AC signal (in effect, a bumpy DC) with an RMS value of about 10V — but it's usually enough to activate a relay.

So, if a suitably rated relay is wired so its coil is activated by this alternator output, the relay contacts will make only when the engine is up and running. Connect the contacts between the main and auxiliary batteries, and the whole thing happens automatically. If you can't do it this way, then it's back to something like the Battery Controller. However, two large batteries may be too much for it and modifications could be needed.

TV as a computer monitor

I have a TV receiver with an S-Video connector. Is it easy to connect it as a computer display, or would that

What's a microcontroller?

I need some help for a school assignment on microcontrollers. That is, I need to know just what a microcontroller is, not what it does. Everyone I've asked doesn't seem to know, so I hope you can help me.

(Jarod Bamford, email)

Let's start with a microprocessor Jarod, as a microcontroller is a form of microprocessor, but with a few more bits. A microprocessor (as you probably know) is the 'brains' of a computer, so a microprocessor is often called a CPU (central processing unit). It needs RAM (random access memory) and ROM (read only memory) to work. The essential boot-up program is in ROM, and when the computer is booted, the CPU typically runs programs that are loaded into RAM. As well, the CPU has to deal with input and output data, through what are called I/O (input/output) ports. For instance, a computer monitor is an output device, a keyboard is an input device, connected through a video port and a keyboard port respectively.

A microcontroller is a microprocessor with RAM, ROM and I/O all on the one bit of silicon. There's a huge range of microcontrollers on the market, but the main differences between them are the amount of on-board RAM, ROM and I/O. Some microcontrollers have other on-board facilities, such as timers, analog to digital converters and serial ports. So the main advantage of a microcontroller is the fact that it doesn't need a lot of external hardware (like ROM, RAM, I/O etc) to work.

Quite often all you need is the microcontroller and a few inexpensive bits (like a crystal for the clock signal) to get a fully functional system. This is why you'll find microcontrollers in washing machines, steam and dry irons and so on. As well, they are usually inexpensive, which is one of the reasons they are used virtually everywhere, while the microprocessor is generally found only in a computer.

require a special interface? (David Pulford, Forestville, NSW)

Sorry David, but you are going to need some specialised hardware to get your computer display on your TV. There are adaptors available, but you aren't going to get anything near the quality of your computer's monitor. Adaptors can cost a few hundred dollars, and you will only get something like 640 x 480 resolution. I suppose the short answer is yes, but it isn't really worth it.

Solar panel regulator

I'm trying to find circuits for regulators for solar systems. Can you help? (Phil, H., email)

We've published a few projects in this area Phil. Perhaps the one to look at is the Intelligent Solar Battery Charger, published November and December 1994. This project was available as a kit, through Oatley Electronics, so you could contact them on (02) 9584 3563. Another project that might be useful is the Solar Battery Charger in the February 1992 edition.

Saving AA batteries

Just a little hint which may be of some interest to readers. Instead of throwing out old AA batteries, particularly alkalines, keep them and use them in your electric clocks. Most clocks seem to work with a battery voltage down to about 0.5V to 0.8V, and batteries which are useless for other things will give about another six months in a clock. (Phil Ereaut, email)

Thanks for this environmentally friendly idea Phil. As you say, most battery powered clocks will run on the sniff of an oily rag, so why waste the available power in supposedly spent batteries.

30A linear power supply

I am getting back into ham radio and would like to build a 20 to 30 amp 13.8 volt power supply that I can use to float charge a decent sized 12V battery to give me a 'no-break' set up for my station. I'd prefer a linear type rather than switchmode, but I want to build it rather than buy it. Any suggestions? (Paul Roper, VK2KZO, email)

About two years ago, Oatley Electronics developed a 12V charger project along the lines you require Paul. You might contact them on (02) 9584 3563 in case parts and a circuit are still available. As you'd expect it's a bit of beast, with busbar style connections and a very heavy transformer. From a technical sense, a linear power supply is the simplest compared to a switcher, but the physics are something else. Read big and heavy!

MOSFETs for Playmaster 200

I built a Playmaster Series 200 amplifier during the 1980s, and it has given many years of faultless service, until recently when it developed an output fault causing the speaker protection circuit to operate. I have torn my house apart trying to find the relevant articles, but to no avail. Is it still possible to obtain a circuit diagram and board overlay for this project? (Rob Secombe, email)

Yes Ron, we can supply photocopies of project articles via our Reader Services department for a nominal charge of $7.50 (includes P&P), or $15 where the project goes over more than one issue of EA — as is the case with the Series 200 amp.

If the unit has blown the output MOSFETs, you'll find them difficult to get hold of, as Motorola has discontinued the metal TO3-format devices. However, Altronics has sourced direct replacements, so check out their catalog for details.

New directions

I wrote my first article for Electronics Australia in 1978, and have been conducting this column for nearly 12 years. I grew up with *EA* in its various incarnations, and I like to blame the magazine for getting me into electronics in the first place.

But electronics has changed so much in the last 10 years. These days components like microprocessors are advertised on commercial TV, when a few years ago these devices were only known about by technocrats. Electronics is now everywhere, affecting everyone, even your grandmother. I tend to see electronics as the underlying technology, not the actual technology. It's applications of the technology that interest people now, not the technology itself, unless you intend becoming an electronics technician. So, *EA* has to respond, as it has done over its 80 or so year history. **ea**

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APOLOGY

ATTENTION KIT CONSTRUCTORS

Some K3130 Temperature Switch Control Switch kits were supplied with metal end panels, instead of the plastic panels originally specified. Depending upon how the kit was assembled, this may compromise electrical safety.

Constructor are advised to disconnect the kit from mains power and check the panels on their kit.
If plastic panels have been supplied, no further action is required. If metal end panels have been supplied, customers should stop using the kit and obtain replacement panels.

To obtain replacement panels, contact:
Dick Smith Electronic Kit Department
"K-3130 End Panels"
PO Box 321 North Ryde NSW 2113
or Phone: 1800 618 459
or e-mail: kits@dse.com.au
Dick Smith apologies for any inconvenience caused.

$10 WONDERS

BY OWEN BISHOP

More hats!

Summer parties carry on well into January, so there's still time to make another electronic party hat!

THIS HAT DISPLAY has a circuit that is entirely different from the one presented last month. It produces the well-known and very effective *chaser* display. The chaser display consists of a row of LEDs of which every third one is lit. The display runs repeatedly through three stages like this:
In any group of three LEDs, they simply switch on in order, one at a time. However, for the row of LEDs as a whole it appears as if there are spots of light travelling from one end of the row to the other.

	Row of nine LEDs								
1	ON	OFF	OFF	ON	OFF	OFF	ON	OFF	OFF
2	OFF	ON	OFF	OFF	ON	OFF	OFF	ON	OFF
3	OFF	OFF	ON	OFF	OFF	ON	OFF	OFF	ON
1 etc.	ON	OFF	OFF	ON	OFF	OFF	ON	OFF	OFF

There are many ways in which this effect can be exploited. A row of LEDs around the brim or crown of a hat can appear to travel round and round the hat. Enough to set your head spinning! Alternatively, you can have an apparently rotating circle of LEDs on the front of the hat. In the photo, the hat has a cutout dinosaur with a green LED for its eye and a row of red LEDs along its back and tail. Its eye 'winks' and the spots of light travel from head to tail, which curls around the back of the hat.

How it works

Basic timing is provided by that old favourite, the 555 timer IC. It is wired as an astable and the component values in Fig.1 give it a frequency of about 5Hz. This provides a reasonably fast-moving display.

The timer is followed by two J-K flip-flops, IC2a and IC2b, both contained in a single package. The J and K inputs of both flip-flops are wired to the positive rail. The effect of this is that the Q and Q-bar outputs of the flip-flops change state each time their clock input receives a rising logic level. As usual, the Q and Q-bar outputs of a flip-flop are the inverse of each other.

The clock input of IC2a is fed from the timer, so its Q output alternates between high and low, but at half the frequency of the timer. The clock input of IC2b is fed from the Q-bar output of IC2a. This flip-flop changes state every time the Q-bar output of IC2a goes high. As a result of this, it changes state at a quarter of the frequency of the timer. If that were all, the circuit would repeatedly run through a four-phase cycle:

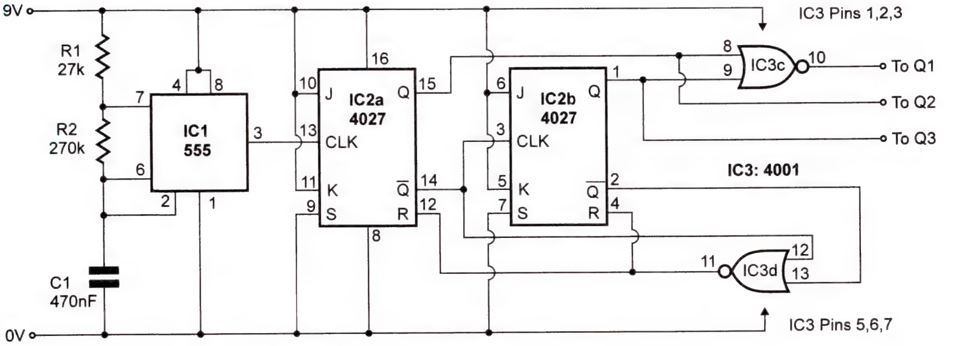
The first step is to get rid of the fourth phase. This is done by taking the Q-bar outputs (which are both low in stage 4) and NORing them together with gate IC3d. When both the inputs of this gate are high, its output goes low. This output is fed to the reset inputs of the flip-flops and the low level resets the flip-fops back to phase 1. So now the circuit runs round a three-phase cycle and has to light one group of LEDs at each phase.

Phase	Q of IC2b	Q of IC2a	LED lit
1	low	low	1
2	low	high	2
3	high	low	3
4	high	high	???

Groups 2 and 3 may simply be lit by using the Q outputs from IC2 and IC2b respectively. All that remains is to switch on Group 1 in Phase 1. This is done by feeding the Q outputs to a second NOR gate, gate IC3c. Its output goes high and switches on Group 1 when both Q outputs are low.

Each of the three signals from IC2 and IC3 go to transistor switches that are identical with those used in last month's circuit. Fig.2 shows a tran-

Fig.1



PARTS LIST

resistors

(0.25 W, 5% or better)

R1	27k
R2	270k
Rb1- Rb3	see text
Rs1 (Rs3	see text

capacitors

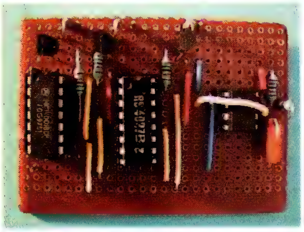
C1	470nF polyester

semiconductors

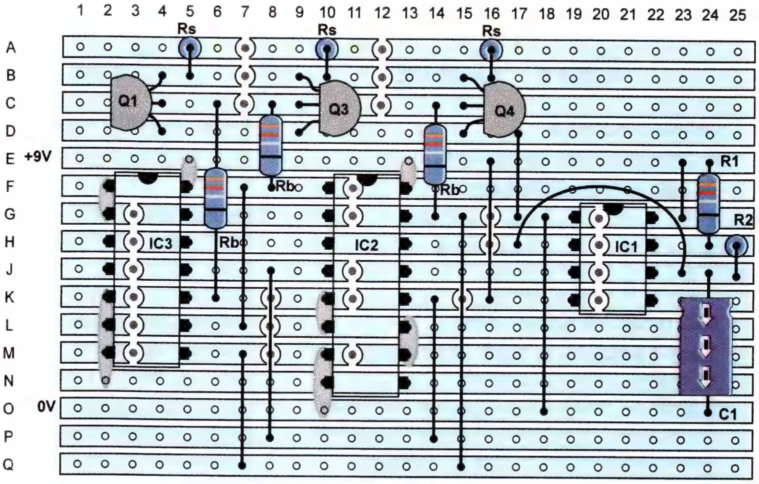
D1-D12	LEDs, (use more, if you like)
IC1	555 timer IC
IC2	4027 dual J-K flip-flop
IC3	4001 quad 2-input NOR gate
Q1 (Q3	BC548 NPN transistor

miscellaneous

Stripboard (16 rows x 25 holes), 5 x 1mm terminal pins, 8-pin IC socket, 14-pin IC socket, 16-pin IC socket, 9V battery clip, crocodile clip, solid-core hook-up wire, light duty hook-up wire, plastic sleeving, card and other materials for making the hat.



Vintage digital: The scarred IC2 in the photo has been in the author's spares box (pins embedded in conductive plastic foam, of course) for about 20 years. It has served in countless projects and still works perfectly. We do not know the manufacturer; the 'RS' in the type number stands for Radio Spares, the company nowadays known as RS Components.



sistor switching four LEDs wired in parallel. This is the minimum for an effective chaser display. If you have five in a group reduce Rs to 82Ω and reduce Rb to 10k. If you have six in a group, reduce them to 68Ω and 9.1k, respectively.

Construction

The circuit is built on a small rectangle of stripboard, with a compact arrangement of the components (Fig.3). We have provided three transistor switches, each of which may switch up to six, possibly more, LEDs. First mount the sockets for the ICs, then solder in the two resistors R1 and R2, the capacitor C1 and the wire links connected to IC1. Use a multimeter to confirm that IC1 is producing a 5Hz signal from pin 3. The strip between pins 1 and 14 is left uncut. Solder the wire links to IC2.

Note that several of the pins of IC2 are connected by blobs of solder beneath the board. The connections are: pins 5 to 6, pins 7 to 8 to 0V, pins 10 to 11, and pin 16 to +9 V. Note also that three of the strips are NOT cut beneath this IC. Apply power and confirm an approximately 2.5Hz signal from pin 15 and a 1.25Hz signal from pin 1.

Now solder the connections to IC3. Two of the gates are unused so their inputs are held at +9V or 0V by solder blobs: pins 1 to 2, pins 5 to 6 to 7 to 0V, pin 14 to +9V.

Remove the ICs from their sockets and wire up the switches. Remember to use appropriate resistor values depending on the number of LEDs each transistor is to switch. To test each switch, temporarily connect an LED between the output pin (the cathode of the LED) and the positive supply (the anode). Take a flying lead from the positive supply and touch this against the sockets for the corresponding pin of the ICs. The LED lights in each case. Remember that the cathode wire is usually indicated by a 'flat' on the rim of the LED. In addition, the cathode wire is usually the slightly shorter of the two.

Solder the negative (black) wire of a battery clip to the 0V terminal of the board. Solder a crocodile clip to the positive (red) wire. The clip acts as a simple switch. Finally, as a protection against possible short circuits, cover the back (soldered side) of the circuit board with lengths of insulating tape laid side by side.

Hat construction

The next step is to make the hat, having carefully measured the circumference of the head of the intended wearer. When we made the dinosaur hat, we cut a rectangle with length equal to the circumference of the wearer's head (50cm). The ends were glued together to form a cylinder. A broad oval of card was cut for the crown, with flaps for gluing to the inside of the cylinder. An oval of thicker card was glued to this to strengthen it. Bands of card of contrasting colour were glued around the hat. Then the dinosaur was cut out of green card and glued in place, its tail curling round to the back of the hat. The hat was finished off by dotting it with self-adhesive gold stars.

Next, prepare the display. This needs a fairly firm support, which is provided in this case by the dinosaur cutout. Decide where each LED is to be and then use a thick pin to pierce two holes about 2.5mm apart. Push the lead wires of the LEDs through these holes. As shown in the Fig.2, the anodes of all LEDs must connected to the positive rail. As you push each LED into place, check that is the right way round. The LEDs must be placed so that the wire that connects the anodes may be conveniently routed between them. Cut the leads to half length and bend each lead outward to form a hook.

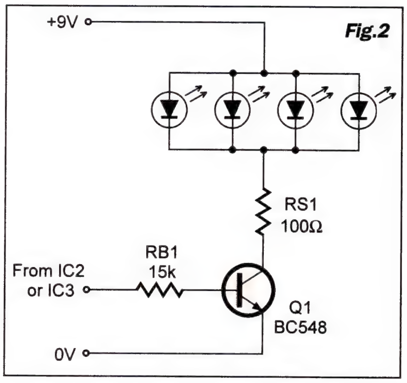


***Fig.2**: The LED driver transistor stage is the same as the one used last month.*

We decided to have twelve LEDs, in three groups of four. Fig.4 shows the wiring. Work out how long a piece of wire will be needed to join all the anodes together. Cut a length of single-core wire and strip off the insulation. Proceed from one end of the array to the other, catching the wire under each anode hook, and running a little solder into the crevice between the wire and the hooked lead. Work quickly so as not to overheat the LEDs. Test each joint before going further. When all anodes are connected, solder a short (8—10cm) length of light-duty hookup wire to one end of the connecting wire. Solder the other end of this wire to the +9V pin on the circuit board.

Next, connect the cathodes (k) of all the LEDs of Group 3 as shown in Fig.4. Take a length of single-core wire and strip off the insulation except at one end where it insulates the wire as it jumps from the end LED to the next one in the group. Work along the group, threading the bare wire through short pieces of sleeving. Finally connect a length of flexible insulated wire at one end and take this to the Q3 switch on the circuit board. Repeat for Groups 2 and 1. Keep the leads as short as possible. When all the connections have been made, insert a battery in the clip, attach the crocodile clip to the +9V supply pin, and check that the display runs as expected.

You can then use sticky parcel tape to fix the circuit board and battery inside the hat to the underside of the stiffening cardboard in the crown. **ea**

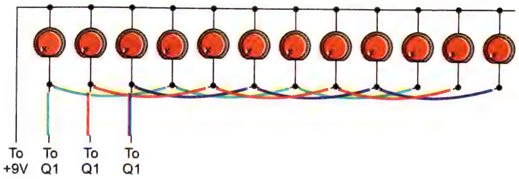


***Fig.4:** Wiring up the hat LEDs to the three driver stages - you'll need to use insulated wire.*

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VINTAGE RADIO

(From page 90)

Other features

The tuning mechanism is mounted on a large metal panel and the dial stringing is unduly complicated. Not only that, the dial pointer is on the *front* of the dial glass, and not behind it. (Just right for catching the sleeve of one's knitted 'cardy').

A novel feature is that the volume and tone controls are connected via cords and pulleys to little red tell-tales which travel vertically alongside the edges of the dial markings. The more red that shows, the more the controls are advanced...

However, without doubt the most stunning feature is the huge map of the world with its universal time indicator. If you look closely at Fig.4, you may see a prominent hole in the upper centre of the escutcheon. Undoubtedly a shaft and control knob should protrude through here, because directly behind the central disc are two pulleys. What you do is set the local time as per the inner disc, to the country marked radially on the rim. Then the time in any part of the world can be directly read off by referring the desired country to the time on the inner disc. However it takes no account of summer time!

It is going to require some fiddling around on a lathe to make up the required shaft and to then connect up the universal time indicator. Then the radio will be fully complete.

Given the selling features of a dual wave radio, the huge dial would have been designed to absolutely capture one's attention and imagination, and generate a sale. It still does! ea

FORUM

(From page 65)

When it's all said and done, there's no question that a properly encoded PAL DVD picture is always going to look better than a properly encoded NTSC one. However, if a video signal was originated in (or for) NTSC, it's always going to look better if it stays in NTSC!

Thanks for those comments, Mr Walters. I'm sure you've given us all quite a few things to ponder on.

To be honest, though, I'm still inclined to think that the simplest approach with movie DVDs would simply be to release them here on region-4 encoded NTSC discs, instead of PAL. After all, most players seem to be capable of delivering standard NTSC video from such discs, and most TV sets sold here in the last five years or so seem to be just as happy displaying either NTSC or PAL. People with old PAL-only TV sets would still be OK if they bought one of the DVD players which can play 'NTSC' discs in PAL format.

By the way who was the Neville you refer to, and describe as having experience with a Pioneer DVD player? I wasn't aware of any Neville writing in about this topic, nor does EA have any current contributors of that name.

Oh, wait a minute. Perhaps *you too* were confused, and really meant to refer to something I wrote myself, in a DVD player review — but used the name of my esteemed predecessor as Forum's conductor. If this was the case I'm flattered, though I doubt if Neville's shade would be all that amused, if he were somehow aware of the slip. Still, he was a pretty forgiving bloke after all! ea

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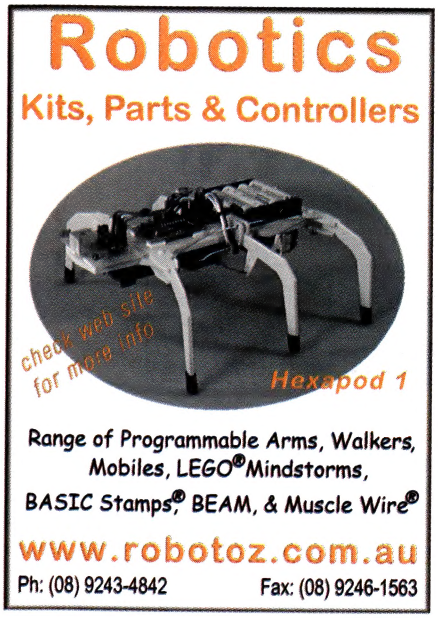

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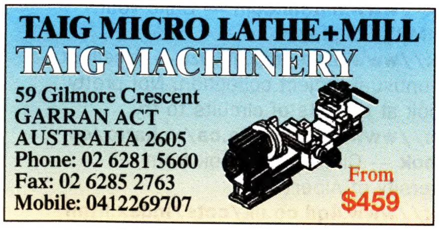

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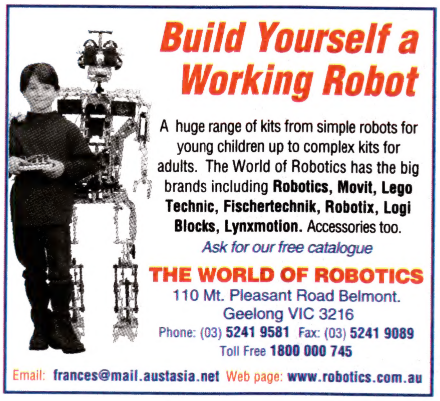

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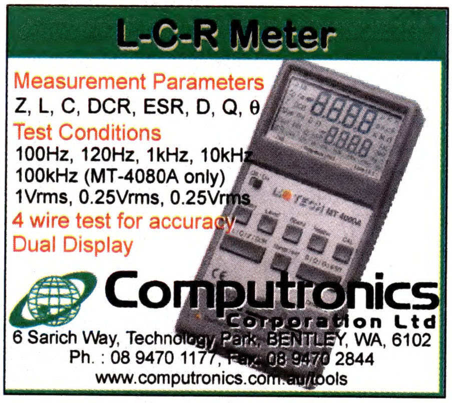

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WEB WATCH

BY DARREN YATES

The Best of Webwatch

RATHER than trawl around the Internet looking for more web-sites, I thought for this month only, it was worth rounding up a list of the best sites in my "favourites" folder in various categories.

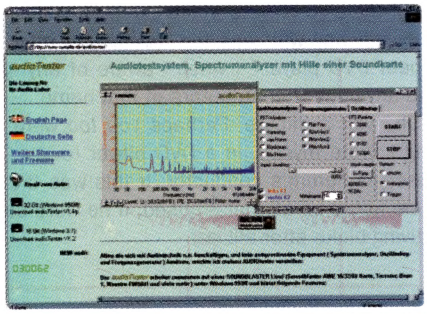
Unfortunately, it's the nature of the Internet for good sites to be good one day and gone the next, so these sites have been checked and are have the best quality of information I've found so far.

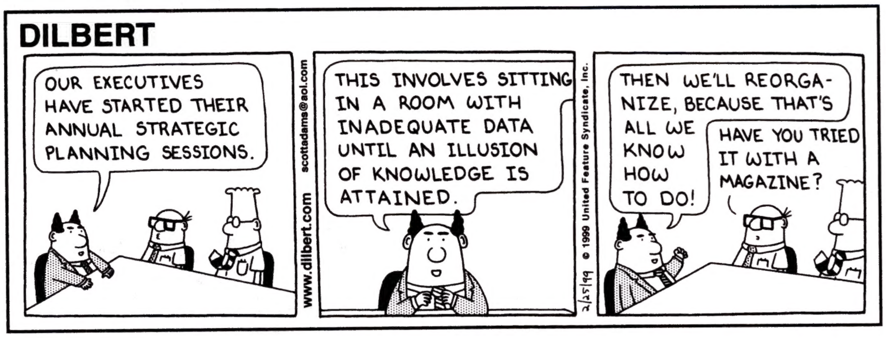
@ Valves

http://www.duncanamps.com/tubedata — TDSL2, the best valve data search engine on the Internet. Over 7500 valves on the database.
http://www.nostalgiaair.org — Nostalgia Air, plenty of valve circuits to look through here, mostly valve radios but well worth it.
http://members.aol.com/sbench101 — Steve Bench is a knowledgeable bloke, lots of good info and unusual circuits.
http://www4.50megs.com/deltablues — Schematic Heaven, where all good valve guitar amp circuits go... Vox, Fender, Marshall, they're all here.
http://www.sonicfrontiers.com/anthem/taste.html — Free 64-page book download on valves. Learn what tone different valves have.
http://www.jps.net/matt7591/test/tubetester.htm — Good info on valve testers, including the AVO CT-160, plus usage tables and some schematics.

@ Software

http://www.duncanamps.com/tsc/index.html — Tone Stack Calculator, the easiest way to get that tone you're after. Simply change the controls and watch the frequency response.
http://www.linearteam.org/winisd.html — My favourite speaker designing freeware, best on the web, both ported and sealed enclosures.
http://www.electronic-repair.com/free.htm — 500,000 strong IC/semi library freeware download.
http://www.sumuller.de/audiotester — Low-cost audio analysis software uses your PC's sound card, also handles total harmonic distortion and signal-to-noise.
http://ourworld.compuserve.com/homepages/jussi/sMain.htm — More free spectrum analysis software.
http://www.us-epanorama.net/software.html — Truckload of electronics software links from CAD/schematic layout to circuit design.

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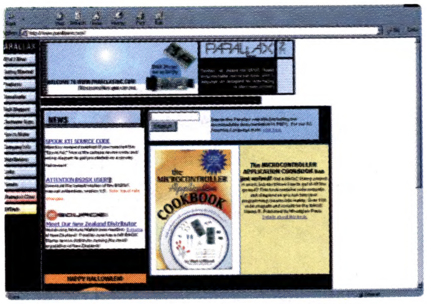

@ Microcontrollers

http://www.atmel.com — Trendy microcontroller being sold by many retailers.
http://www.parallaxinc.com — Makers of the BASIC STAMP microcontroller.
http://www.microchip.com — Makers of the popular PIC range of micros.
http://www.dontronics.com/download.html — Freeware and shareware compilers for micros.
http://come.to/thepicarchive — David Tait's PIC archive - lots of PIC info.
http://www.picpoint.com — large database of PIC freebies.

@ Projects

http://www.mp3ar.com — Build your own MP3 CD player.
http://www.intio.or.jp/jf1ozl — Excellent and unusual project collection. Not pretty to look at but lots of circuits to try.
http://www.ee.ualberta.ca/~charro/cookbook — Circuit cookbook from University of Alberta.
http://www.4qd.co.uk/ccts/index.html — Good resource for beginners in Electronics.
http://www.halcyon.com/sciclub/kidproj1.html — Science Club for kids, good info.
http://www.lvr.com/parport.htm — All the info you'll ever need on the PC parallel port.

It's also the nature of the Internet for new sites to turn up all the time so keep your eyes out. You never know what gems you might come across. If you come across any that you think could (or should) feature in Webwatch, drop us a line. Write, fax or email us here at EA at **info@www.electronicsaustralia.com.au** and let everyone else know about it! ea

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